REPORT OF THE PROCEEDINGS

OF THE

Eighteenth Annual Convention

OF THE

MASTER CAR-BUILDERS' ASSOCIATION,

HELD IN

SARATOGA, N. Y.,

June 10th, 11th and 12th,

1884.

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SARATOGA, N. Y., JUNE 10th, 11th and 12th, 1884.

The Convention was called to order at 10.30 A. M. by the President, Mr. Leander Garey, of the New York Central and Hudson River Railroad.

THE PRESIDENT—Ladies and gentlemen, I have the honor of introducing to you Mr. Cowan, President of the village of Saratoga.

MR. COWAN then addressed the Convention, and welcomed the members to Saratoga.

THE PRESIDENT—On behalf of the members of the Master Car-Builders' Association I most sincerely thank you for the kind hospitality which you have offered us, and, knowing the members as well as I do, can assure you it is well appreciated.

The Secretary then called the roll, and the following members answered to their names:

Thomas A. Bissell, W. R. Davenport, George W. Demarest, J. E. Doran, T. G. Duncan, John B. Fletcher, C. E. Garey, C. E. Gore, George Hackett, George Hackney, John Hill, John Hodge, W. L. Hofecker, D. Hoit, Samuel Irwin, B. McDevitt, J. D. McIlwain, Reuben McPherson, William McWood, J. N. Mileham, E. Minshull, L. Packard, B. N. Phelps, Elias E. Pratt, Peter Smith, T. B. Stewart, John Sweeney, H. A. Webster, J.

H. F. Wiers, F. D. Adams, R. C. Blackall, Charles Blackwell, John W. Cloud, H. L. Cooper, John S. Ellis, Leander Garey, Jacob P. Hovey, Sanford Keeler, John S. Lentz, Henry D. Lyons, John Mackenzie, R. McKenna, Robert Miller, D. C. Richardson, W. B. Snow, R. H. Soule, H. D. Titus, Joseph Townsend, W. F. Turreff, B. K. Verbryck, E. B. Wall, Charles C. Williams, Sam'l D. Billings, Eugene Chamberlain, L. Finley, Joseph Wood, James N. Lauder, John Henney, Jr., Joseph Armbruster.

MR. C. E. GAREY moved that the reading of the minutes of the last meeting be dispensed with.

The motion was seconded.

THE SECRETARY—Before the minutes are adopted I will ask that an error in them, which was due to the carelessness of the Secretary, or the oversight of the Reporter, be corrected. There is a resolution on page 97 of the last report, "that the Executive Committee be instructed to revise the resolutions relating to the recommendation of standards, and report to the Convention what action, if any, is necessary to correct existing errors and discrepancies in the previous action of the Association." There is no record in the minutes of the adoption of that resolution. I would request that a resolution be passed correcting that error.

It was agreed that the correction be made, and the minutes were then adopted as printed.

The President then addressed the Convention as follows:

Gentlemen of the Convention:

Probably the purpose of the annual meetings of this Association, of which this is the eighteenth, cannot be expressed better than it is in the constitution, which you have adopted, which says:

SEC. 1. The objects of this Association shall be the advancement of knowledge concerning the construction, repair and service of railroad cars, by discussions in common, investigations and reports of the experience of its members; to provide an organization through which the members, and the companies they represent, may agree upon such joint action as may be required to bring about uniformity and interchangeability in the parts of railroad cars, to improve their construction and to adjust the mutual interests growing out of their interchange and repair.

Committees have been appointed to make reports on special subjects. These reports will be called up at the proper time for discussion and for such action as you may think is required. It is hoped that those members who have any decided convictions or valuable knowledge, concerning the subjects to which these reports pertain, will give expression to their ideas and not remain

silent, as so many who could make valuable contribution to our discussions so often do.

Of the advantage which results to railroad companies from the adoption of standards, it is perhaps not necessary to speak here. The performance of your regular duties has, no doubt, convinced you "that an enormous saving to railroad companies would result if the construction of those parts of cars which require most frequent renewal could be made more nearly uniform. It is certain, too, that much of the loss of life and injury to railroad employees and others would be prevented, if railroad companies could generally be induced to adopt the recommendations of the Master Car-Builders' Association, which have that end in view."

The growing interchange of traffic makes it daily more important, that those parts of cars, which require most frequent renewal, should be made uniform. The accomplishment of this end makes energetic action by the members of the Association imperative.

A standard freight car truck, including the brakes and brake-attachments, should be decided upon, and recommended for adoption, at as early a date as possible. A system of lettering and numbering cars should be perfected and recommended, so that their ownership could be determined upon, without the difficulties which are now so often encountered.

Standard detailed drawings of dead blocks should be made and published, with the proceedings of this Association, as uniformity in the size and adjustment of these parts on all cars is essential. The matter of freight car couplers has claimed by its importance much attention. The press, State legislatures, and railroad commissioners have endeavored to effect a change in the manner of coupling freight cars; and inventors by the thousand have spent both time and money to devise some method by which such cars could be coupled automatically, or in some way which would prevent the necessity of train men standing between cars, while in the act of coupling.

I would call your attention to the following quotations relating to this subject, taken from the reports of the Railroad Commissioners of several different States. In their report for 1883, the Commissioners of the State of New York, say: "When a satisfactory coupler can be secured, the expense is not a matter which ought

to delay its adoption. The statute which will compel earnest endeavor on the part of the railroads to solve this question in the interests of humanity, ought to be passed; with such provisions as to the time of its becoming imperative, as would protect railroads from being required to adopt impracticable devices to their pecuniary disadvantage and to the detriment of their business."

The Commissioners of the State of Minnesota, in their report for 1883, say: "The number of brakemen killed and injured while coupling and uncoupling cars, recalls each year the question, whether something cannot be accomplished to diminish the loss of limbs and lives resulting from this class of accidents."

The report of the Commissioners of the State of Iowa, for the same year, in referring to those killed and injured while coupling cars, says: "We are fully of the opinion that some method of coupling cars should be adopted, that would enable them to be coupled without going between them; if this can be done, we are inclined to believe that it would justify a large expenditure and relieve the roads from a grave responsibility."

The Commissioners of the State of Massachusetts, in 1884, reported that "The great number of accidents that are due to the coupling and uncoupling of freight-cars, continues to be a subject of regret. One reason for delay that has hitherto been urged with some success, has been the hope that the Master Car-Builders' Association would agree upon some one standard freight coupler, which would be adopted by all the railroads in the country and so prevent the necessity of legislation; but the annual meeting of this association for 1883 has been held, without any advance towards an agreement on this subject. Reliance has been placed on the action of this justly respected Association because of its selection of a standard height for draw-bars, which was so readily adopted; but, it should be remembered, that the adoption of a standard height cost nothing; uniformity was clearly desirable, but it did not involve the purchase of a patent right, or the rival claims of inventors. In the selection of an automatic coupler the question is complicated by conflicting interests and in its adoption the obstacle of cost is a serious one. It is probable that the question will never be satisfactorily settled until the law of liability of employers to employees has been thoroughly revised; the working of a just law, covering this whole subject, would be liable to supersede the necessity for special legislation as to couplers or draw-bars."

In the report of the Commissioners of the State of Connecticut it is said: "Whenever a man shall be found among the Master Car-Builders, or indeed anywhere, who possesses the enthusiasm, wisdom, judgment, tact, energy and perseverance of W. F. Allen, Secretary of the General Time Convention, who will give himself to the coupler question, it will be solved."

The following circular from the Massachusetts Railroad Commissioners, dated Boston, May 8, 1884:

"All new freight cars owned by Massachusetts railroad companies are, after March 1, 1885, to be equipped with automatic or other safety couplers, approved by this Board after examination and test thereof."

To the members present at this meeting it should be said that committees have been appointed repeatedly by the Association, and they have made reports on this subject. At the adjourned meeting, held at Niagara Falls, in October, 1882, your committee selected and recommended as worthy of trial several couplers, all of which, with others, are in use to some extent. The time has now arrived when the best known couplers should be selected and recommended by the members of this Association for adoption. Precisely how this action should be brought about it is not easy to indicate. It seems, however, that if there are any automatic couplers known to the members of this Association, which fulfill the conditions required of such appliances, that we should, by suitable resolutions, announce that fact, for the benefit of railroad companies and the public.

Other necessary standards should be determined upon with as little delay as possible. I take pleasure in complimenting you on the good results which have been brought about through the annual meetings of the Association, and trust that the subjects to be presented for your consideration during this meeting will be judiciously disposed of.

An annual address of this kind nearly always imposes the melancholy duty of announcing the death of one or more of our number during the preceding year. Soon after our last convention, W. J. McFarland, of the Chesapeake and Ohio Railroad, died at his home in Richmond, Va. At the proper time a committee will be appointed to prepare a memoir of his life, for publication with the annual report of the Association.

Thanking you for your kind attention, I now invite all

those who may wish to join our organization to sign the constitution, which is in the hands of the Secretary.

A recess was then taken to enable those wishing to join the Association to sign the constitution.

The following Special Committees were appointed:

On Correspondence and Resolutions:—James T. Leighton and Sydney P. Ensign.

To nominate officers for the ensuing year:—James M. Lauder, Joseph Wood, Sanford Keeler, Thomas Aylesbury, and W. F. Turreff.

The Secretary presented his report, as follows:

REPORT OF THE SECRETARY.

The list of members published with the report of the adjourned meeting, held at Niagara Falls, included the names of 145 active members, 36 representative and 4 associate members, or a total of 185 members. In the list published with the report of the last annual convention, the names of 45 of these active members and 3 representative members were omitted for various causes, leaving 100 active members, 33 representatives and 4 associates, or a total of 137 old members. The last list, however, includes 33 new active members and 20 new representatives, so that the list included a total of 190 members. Since the publication of the list 6 active members and 2 representatives have resigned, but up to the date of this convention 6 new active members and 4 new representative members have been added to the Association, so that the membership now stands 133 active, 55 representative, and 4 associate members, or a total of 192 members. These figures indicate an increase of only 7 in the membership, if compared with the figures published a year and a half ago. That list, however, included the names of many persons who were no longer identified with the Association, and who neither attended its meetings nor paid the dues. With few exceptions, the membership now includes only those who are interested in the Association and its work.

The number of cars represented at the last meeting was 357,030. Although not all the representative members have reported the number of cars now owned, yet from the returns received, and with those which the new members will represent,

it is safe to say that there will be nearly or quite 400,000 cars represented in this convention.

The arrears for dues is still quite large. There are thirty-two active members who owe $5 each, six owe $10, eight owe $15, and eleven owe $22 each, one associate member owes $5 and two owe $20 each, making a total due the Association of $605. There is also $632.50 due from representative members, making a total of $1,237.50. Last year the unpaid dues were $915.

The cash collected and expenses incurred by your Secretary during the year have been as follows:

JUNE 10, 1884.

M. N. FORNEY, Secretary,

In account with The Master Car-Builders' Association.

To dues collected from the following members during year:

1883.			
June	12.	W. E. Chamberlain	$15 00
"	12.	E. A. Avery	5 00
"	12.	T. G. Duncan	5 00
"	12.	Thos. B. Hunt	5 00
"	12.	R. M. Messimer	5 00
"	12.	J. P. Coulter	5 00
"	12.	Rob't McKenna	5 00
"	12.	John Hill	15 00
"	12.	Thos. Greenland	5 00
"	12.	Geo. Hackney	5 00
"	12.	J. T. Chamberlain	5 00
"	12.	John Mackenzie	5 00
"	12.	H. L. Cooper	5 00
"	12.	C. E. Gore	5 00
"	12.	S. Griffith	5 00
"	12.	B. F. Manier	5 00
"	12.	J. C. Barber	5 00
"	12.	S. Irvin	5 00
"	12.	J. B. Fletcher	5 00
"	12.	E. D. Carter	5 00
"	12.	H. S. Bryan	5 00
"	12.	C. C. Williams	5 00
"	12.	James McGee	5 00
"	12.	Joseph Townsend	5 00
"	12.	John Hodge	5 00
"	12.	B. McDevitt	5 00
"	12.	Frank Howard	5 00
"	12.	J. N. Mileham	5 00
"	12.	H. A. Webster	15 00
"	12.	Sam'l D. Nye	5 00
"	12.	A. G. Steinbrunner	5 00

June	12.	R. V. Coon	$15 00
"	12.	Isaac N. Keith	5 00
"	12.	D. Hoit	5 00
"	12.	P. Riley	5 00
"	12.	T. L. Seevers	5 00
"	12.	C. A. Burchard	5 00
"	12.	T. Sutherland	5 00
"	12.	J. L. Adams	5 00
"	12.	John Voorhees	5 00
"	12.	Geo. C. Watrous	5 00
"	12.	T. H. Munsell	5 00
"	12.	G. H. Gramling	5 00
"	12.	D. C. Richardson	5 00
"	12.	C. E. Garey	5 00
"	12.	Geo. Rommel	5 00
"	12.	M. P. Ford	5 00
"	12.	W. T. Hildrup	5 00
"	12.	W. McWood	5 00
"	12.	W. R. Davenport	5 00
"	12.	Samuel Stevens	5 00
"	12.	Israel Lee	15 00
"	12.	B. K. Verbryck	5 00
"	12.	H. D. Lyons	5 00
"	12.	Wm. A Short	5 00
"	12.	J. H. Raymond	5 00
"	12.	L. Packard	5 00
"	12.	N. M. George	5 00
"	12.	S. P. Ensign	5 00
"	12.	T. Aylesbury	10 00
"	12.	M. M. Pendleton	5 00
"	12.	Allen Vail	5 00
"	12.	Geo. E. Stevens	15 00
"	13.	J. W. Fleming	2 50
"	13.	Wm. O. Smith	5 00
"	13.	F. O. Bray	10 00
"	13.	O. P. Dunbar	5 00
"	13.	R. H. Parks	5 00
"	13.	Thos. Cassady	5 00
"	13.	B. N. Phelps	5 00
"	13.	J. L. Hackathorn	15 00
"	13.	J. D. McIlwain	20 00
"	13.	J. E. Doran	5 00
"	13.	H. F. Snyder	5 00
"	13.	Wm. H. Trainham	5 00
"	13.	Howard Carlton	5 00
"	13.	Frank J. Hecker	5 00
"	13.	R. M. Hemphill	15 00
"	14.	J. C. Terry	5 00
"	14.	T. C. Salveter	5 00
"	14.	W. H. Ramseyer	5 00

June	14.	J. G. McCuen	$5 00
"	14.	H. C. McCarty	5 00
"	14.	Peter Smith	5 00
"	14.	E. Pratt	5 00
"	14.	John C. Richardson	5 00
"	14.	C. A. Goodrich	5 00
"	14.	B. Warren	5 00
"	14.	R. W. Bushnell	20 00
"	14.	J. W. Fleming	5 00
"	14.	J. T. Leighton	5 00
"	14.	John Sweeney	5 00
"	14.	G. M. Taylor	5 00
"	14.	Jacob P. Hovey	2 50
"	14.	H. S. Billings	15 00
"	14.	G. W. Demarest	5 00
"	14.	E. A Olmstead	5 00
July	24.	John P. Levan	15 00
August	6.	R. Donaby	5 00
1884.			
March	18.	C. F. Scoville	5 00
"	18.	Willis Davis	5 00
"	18.	J. Van Vechten	5 00
"	18.	John P. Levan	5 00
"	21.	Job Jackson	5 00
"	22.	K. A. Blackwell	5 00
"	22.	Robt. McKenna	115 00
"	22.	F. Johnson	5 00
"	22.	G. M. Taylor	5 00
"	22.	Geo. C. Watrous	5 00
"	22.	Caspar Wickes	7 50
"	22.	Joseph Townsend	35 00
"	22.	J. T. Gause	5 00
"	24.	T. A Bissell	5 00
"	26.	B. K. Verbryck	35 00
"	26.	S. W. Murray	5 00
"	26.	Jacob P. Hovey	5 00
"	27.	D. C. Richardson	5 00
"	27.	William A. Short	5 00
"	28.	Joseph Taylor	5 00
"	28.	James McGregor	5 00
"	29.	Charles H. Kennison	15 00
"	31.	H. S. Huidekoper	10 00
"	31.	E. B. Wall	55 00
"	31.	W. B. Snow	45 00
April	2.	J. W. Marden	20 00
"	4.	Robert Miller	55 00
"	5.	John S. Lentz	27 50
"	5.	Charles Graham	5 00
"	7.	J. T. McCrumm	10 00
"	9.	W. G. Van Buskirk	5 00

April	9.	F. D. Adams	$35 00	
"	11.	H. Stanley Goodwin	95 00	
"	11.	John Kirby	90 00	
"	16.	S. W. Haines	10 00	
"	19.	George Hackett	5 00	
"	21.	John W. Cloud	237 50	
"	21.	W. F. Turreff	40 00	
"	25.	Henry D. Titus	5 00	
"	28.	T. L. Chapman	35 00	
May	2.	T. B. Stewart	5 00	
"	2.	Robert C. Blackall	55 00	
"	5.	J. H. Wickes	5 00	
"	5.	B. Warren	25 00	
"	8.	W. L. Hofecker	5 00	
"	8.	Charles Blackwell	15 00	
"	12.	William Forsyth	75 00	
"	19.	D. B. Peabody	5 00	
"	26.	Charles Blackwell	5 00	
"	26.	Thomas Southerland	10 00	
"	26.	J. N. Lauder	5 00	
"	26.	Sanford Keeler	10 00	
"	29.	Leonard Finley	5 00	
June	3.	C. H. Hill	5 00	
"	3.	James McGee	15 00	
"	3.	M. P. Ford	5 00	
"	4.	James Denver	5 00	
"	5.	W. A. Morgan	5 00	
"	5.	Samuel D. Billings	5 00	
"	10.	Annual reports sold during year	28 90	
1883.				
June	14.	By cash paid to B. K. Verbryck, Treasurer.		$572 50
1884.				
June	9.	By cash returned to persons not eligible for membership		10 00
June	9.	By cash for stationery during year		30 55
"	9.	" reporting last convention		240 00
"	9.	" printing annual reports		498 57
"	9.	" engraving		70 29
"	9.	" postage for year		78 00
"	9.	" printing circulars		114 75
"	9.	" express charges		40
June	9.	By balance paid to to B. K. Verbryck. Treasurer		886 34
			$2,001 40	$2,001 40

Summed up briefly, the receipts were $2,001.40, and the expenses, not including the salary of your Secretary, were $1,042.56. The Association is indebted to its Treasurer for

$26.78, and to its Secretary, $500.00. As there is $386.34 cash on hand, the Association begins the year with an indebtedness of $140.44. All accounts have been paid excepting some bills for printing the reports, which will be presented at this meeting, but these properly belong to the expenses of the new year.

M. N. FORNEY,
Secretary.

THE PRESIDENT announced that the Executive Committee had decided to make the annual dues $5.

THE TREASURER presented his annual report, as follows:

TREASURER'S REPORT, JUNE 10, 1884.

	Dr.	Cr.
Received from M. N. Forney, Secretary, amount of dues collected by him from members..	$1,972 50	
" from sale of annual reports.....	28 90	
By balance due Treasurer June 12, 1883.....		$99 28
" amount paid Secretary for six months' salary.....		500 00
" amount returned to persons not eligible for membership.....		10 00
" amount paid for stationery.....		30 55
" " " reporting last convention.....		240 00
" " " printing annual report.....		498 57
" " " engraving.....		70 29
" " " postage for year.....		78 00
" " " printing circulars.....		114 75
" " " express charges.....		40
" balance cash on hand.....		359 56
	$2,001 40	$2,001 40

THE PRESIDENT—The next business in order is the election of the Auditing Committee. I will ask the Secretary to read that part of the constitution which refers to the election of the Auditing Committee.

The Secretary read Section 2 of Article 8 of the Constitution.

MR. F. D. ADAMS—I would nominate for that Committee Mr. W. R. Davenport, Mr. Robert Miller and Mr. J. H. F. Wiers.

MR. LENTZ—I move that the Secretary be directed to cast the ballot of the Association for the gentlemen nominated as an Auditing Committee.

Agreed to.

The President appointed Mr. Hackett as teller, who announced that the Secretary had cast the ballot of the Association for the nominees.

THE PRESIDENT—Is there any unfinished business?

THE SECRETARY—There are several things which should, perhaps, come under that head. An explanation ought, perhaps, be made by the Secretary concerning a resolution made by Mr. Goodwin, which is printed on

page 101 of the last Annual Report, in regard to standard dead-blocks. The resolution instructed the Secretary to submit the matter to the letter ballot of the members. That ballot was never submitted, because some discrepancies were discovered in the resolution, and on consultation with Mr. Goodwin it was agreed that it would be better not to submit the matter to a letter ballot. I do not know whether any action is necessary.

I will call the attention of the Association to an amendment to the constitution proposed last year which will be found on page 35 of the report. Mr. Davenport proposed that the constitution be amended by adding to article 10: "The name of any member who is three years in arrears for dues may be struck from the list of members at the discretion of the Executive Committee." The constitution requires that any amendment to it shall lie over for one year. It was therefore put over for action at this meeting.

MR. GOODWIN—I move the adoption of the amendment.

Agreed to.

THE SECRETARY—On page 97 of the Annual Report, a resolution will be found instructing the Executive Committee to revise the standards. I will read that resolution:

"*Resolved*, That the Executive Committee be instructed to revise the resolutions relating to the recommendations of standards, and report to the next annual meeting what action, if any, is required to correct existing errors and discrepancies in the previous action of the Association."

The Executive Committee have made their report and it is printed. I would say to the members present that these are not new standards; that they are simply rectifications of the old standards which were adopted and in which there were some discrepancies.

The report was then read, and is as follows:

REPORT OF THE EXECUTIVE COMMITTEE OF THE MASTER CAR-BUILDERS' ASSOCIATION, ON REVISION OF RESOLUTIONS RELATING TO THE RECOMMENDATION OF STANDARDS.

The Committee recommend the following changes in the resolutions relating to standards:

1. That the action of the Association, adopted June 10, 1868, regarding a "Standard Gauge Form," and printed on pages 126 and 127 of the last annual report, and included between the titles "Standard Wheel Gauge" and "Width of Wheel Tread," be repealed.

2. That the first resolution, under the title "Width of Wheel Tread," on page 128, which recommends "five-inch tread as the proper width for car-wheels running on a compromise gauge of track," be repealed.

3. That the standard height of draw-bars for freight cars, measured perpendicularly from the tops of the rails to the centre

of the draw-bar, which was adopted at the meeting held in Richmond, Va., in 1872, is hereby declared to be 2 ft. 9 in., when the car is loaded to its full carrying capacity.

4. That the first recommendation, included in the first two paragraphs under the title "Dead-woods," on page 135 of last annual report, be repealed.

5. That the resolutions on pages 142 and 143 of last annual report under the titles "Patentee and Supply Agents" and "Objects of the Association" be repealed, as the purpose of the first is covered by the IX. By-law, and that of the second resolution by Article II. of the Constitution.

6. That the capacity of draw and buffer springs be not less than 18,000 pounds instead of 13,000 pounds, as recommended at the Thirteenth Annual Convention (*see page* 100 *of Report of that meeting*).

7. That the distance, 12 in., between dead-blocks, recommended at the Sixteenth Annual Convention, be changed to 14 in., that the length over all be changed from 28 to 30 in., and the distance from centre to centre be 22 in., instead of 20.

The Committee propose the following codification of the resolutions and action of the Association with reference to other standards and other matters, including the proposed changes specified above:

STANDARD DIMENSIONS, FORMS OF CONSTRUCTION, ETC., ADOPTED BY THE MASTER CAR-BUILDERS' ASSOCIATION.

WHEELS AND AXLES.

Width of Wheel-Tread.

The standard width of wheel-tread, recommended at the Sixteenth Annual Convention, held in Philadelphia in 1882 (*see page* 179 *of Report for that year*), is $5\frac{1}{2}$ in., measured from outside of tread to inside of flange.

Diameter of Chill-Molds for Car-Wheels.

The standard diameter for chill-molds, recommended at the Sixteenth Annual Convention, held in Philadelphia in 1882 (*see pages* 178 *and* 179 *of that year*), for 33-in. wheels is

$33\frac{1}{2}$ in. at the point indicated in Fig. 1, and for 30-in. wheels $30\frac{3}{8}$ in.

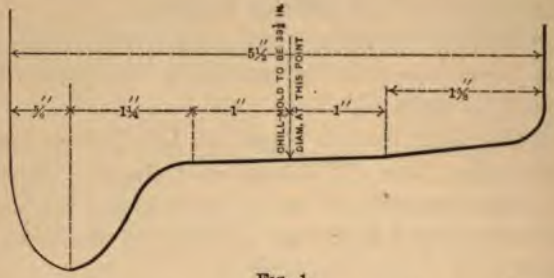


Fig. 1.

Distance between the Backs of the Flanges of Car Wheels.

The standard distance between the backs of the flanges of car-wheels as indicated at A, Fig. 2, is 4 feet $5\frac{3}{8}$ inches.

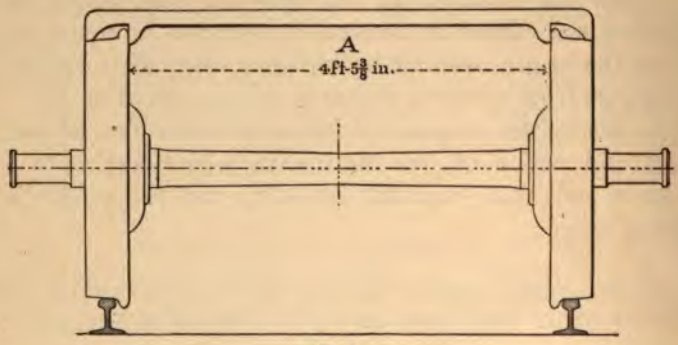


Fig. 2.

This distance was proposed in a resolution adopted at the Seventeenth Annual Convention held in Chicago in 1883 (*see page* 55 *of the Report of that meeting*) and was afterwards submitted to and approved by a letter ballot (*see pages* 118–120 *of Seventeenth Annual Report*).

Wheel and Axle Gauges.

At the Sixteenth Annual Convention, held in Philadelphia in 1882 (*see page* 197 *of Report for that year*), it was

"*Resolved*, That the sense of this meeting is that all the gauges recommended by the Committee on Wheel Gauge should be in use in all repair and car building shops of every equipment."

These gauges are shown in Plate VI. of the last annual report.

Boring Wheels.

At the Seventeenth Annual Convention (*see page* 57 *of the Report*) a resolution was adopted recommending that six dogs be used for centering wheels when they are bored.

Standard Axle.

The dimensions represented in Plate II. of last annual report, were recommended by the Association as a standard for car-axles at the annual convention held in Boston in 1873. (*For other action, with reference thereto, see Tenth Annual Report, page* 99; *Twelfth Annual Report, page* 129; *and Thirteenth Annual Report, page* 103.) The dimensions in the engraving, Plate II., were adopted by both the Master Car-Builders' and American Railway Master Mechanics' Association, after a conference of committees appointed by each Association. (*See Fourteenth Annual Report, page* 130.)

JOURNAL-BEARING, JOURNAL-BOX AND PEDESTAL.

Journal-Bearing.

Plates III., IV., and V., in last annual report, represent the standard for journal-bearings, journal-boxes, and pedestals, recommended at the Eighth Annual Convention, held in Cincinnati in 1874. (*See page* 40 *of Report for that year.*) This action was reaffirmed at the Fifteenth Annual Convention, held in New York in 1881. (*See pages* 14, 15 *and* 27 *of Report for that year.*)

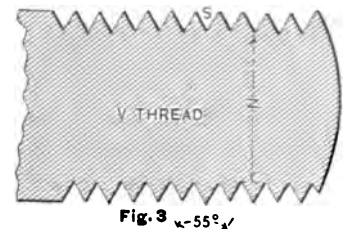
SCREW THREADS.

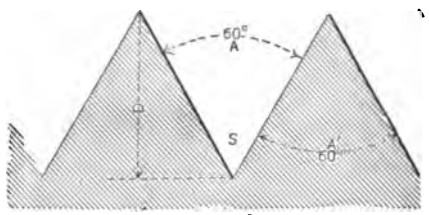
What is known as the Sellers' or Franklin Institute System of Screw-threads, Bolt-heads and Nuts was recommended as a standard at the Fifth Annual Convention, held in Richmond, Va., in 1872. (*See pages* 18 *and* 21 *of the Report of that meeting. See also pages* 82 *and* 83 *of Report of Thirteenth Annual Convention.*)

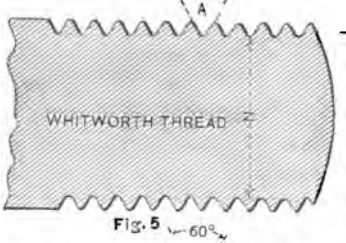
This system was proposed by Mr. William Sellers and was described by him in an essay read before the Franklin Institute of Philadelphia, April 21, 1864. In that essay the system is described as follows:

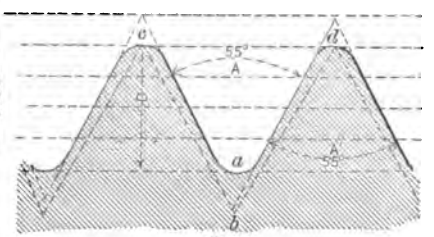
"The proportions for the proposed thread and its comparative relation to the sharp and rounded threads, will be readily understood

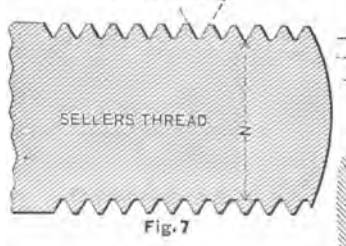
from the accompanying diagrams, in which Figs. 3 and 4 represent a sharp thread, Figs. 5 and 6 a rounded top and bottom to the English proportions, and Figs. 7 and 8 the flat top and bottom, all

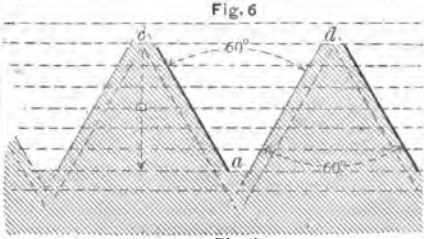












of the same pitch. The angle of the proposed thread is fixed at 60°, the same as the sharp thread, it being more readily obtained than 55°, and more in accordance with the general practice in this country. Divide the pitch, or, which is the same thing, the side of the thread into eight equal parts, take off one part from the top and fill in one part in the bottom of the thread, then the flat top and bottom will equal one-eighth of the pitch; the wearing surface will be three-quarters of the pitch, and the diameter of screw at bottom of the thread will be expressed by the formula:

$$diameter - \frac{1.299}{number\ of\ threads\ per\ inch.}\ ,,$$

The table (in last report) is reprinted from Mr. Sellers' essay, and gives the proportions of his standard screw-threads, nuts and bolt-heads.

At the Sixteenth Annual Convention, held in Philadelphia in 1882 (*see page* 229 *of the Report of that meeting*), it was

"*Resolved*, That this Association deprecates the use of screws larger or smaller in diameter by a small fraction of an inch than the sizes specified for the Sellers or Franklin Institute system, and that all the members of the Association are urged to abandon entirely the use of over or under size screws."

At the same meeting the Committee on Standard Screw Threads was instructed (*see page* 229 *of the Report of that meeting*) "to procure a set of the unhardened gauges manufactured by the Pratt & Whitney Company, these to be kept among the archives of the Association, as the standard of measurement of screw threads and for ultimate reference in case of need." The Committee was also instructed to get a standard two-foot rule.

The Committee procured the screw gauges and rule and delivered them to the Association, at the adjourned meeting held at Niagara Falls in October, 1882.

Limit Gauges for Round Iron.

At the Seventeenth Annual Convention, held in Chicago in June, 1883, the following resolution was presented (*see pages* 37 *and* 38 *of the Report of that meeting*):

"*Resolved*, That the following sizes for limit gauges for round iron for the Sellers standard threads are hereby established by the Master Car-Builders' Association as the standard sizes for such gauges, and that it is recommended that round iron of the nominal standard sizes be made of such diameter that each one *will* enter the large or + end of the gauge intended for it, *in any way*, and will *not* enter the small or — end *in any way*.

Sizes of Limit Gauges for Round Iron.

Nominal diameter of Iron. Inches.	Large size. + end. Inches.	Small size. — end. Inches.	Total variation. Inches.
¼	.2550	.2450	.010
5/16	.3180	.3070	.011
⅜	.3810	.3690	.012
7/16	.4440	.4310	.013
½	.5070	.4930	.014
9/16	.5700	.5550	.015
⅝	.6330	.6170	.016
¾	.7585	.7415	.017
⅞	.8840	.8660	.018
1.	1.0095	.9905	.019
1⅛	1.1350	1.1150	.020
1¼	1.2605	1.2395	.021"

A motion to submit this resolution for decision by letter ballot was adopted. On submitting it to the members more than two-thirds of the votes cast were in favor of the resolution, and it is, therefore, adopted, and the dimensions named are now the

FIG. 9.

FIG. 10.

standard sizes of limit gauges for round iron. Fig. 9 represents the form of caliper gauge that was proposed, and Fig. 10 shows a cylindrical gauge to be used for testing the size of the caliper gauges.

DRAW GEAR.

HEIGHT OF DRAW-BARS.

The standard height for draw-bars, which was recommended, or was intended to be recommended, at the Fifth Annual Convention, held in Richmond, Va., in 1872, is 2 ft. 9 in., measured perpendicularly from the tops of the rails to the centre of the draw-bar, when the car is loaded to its full capacity. (*See pages* 42, 43, *and* 46 *of the Report of that meeting.** *See also Report of Thirteenth Annual Convention, pages* 108 *and* 109.)

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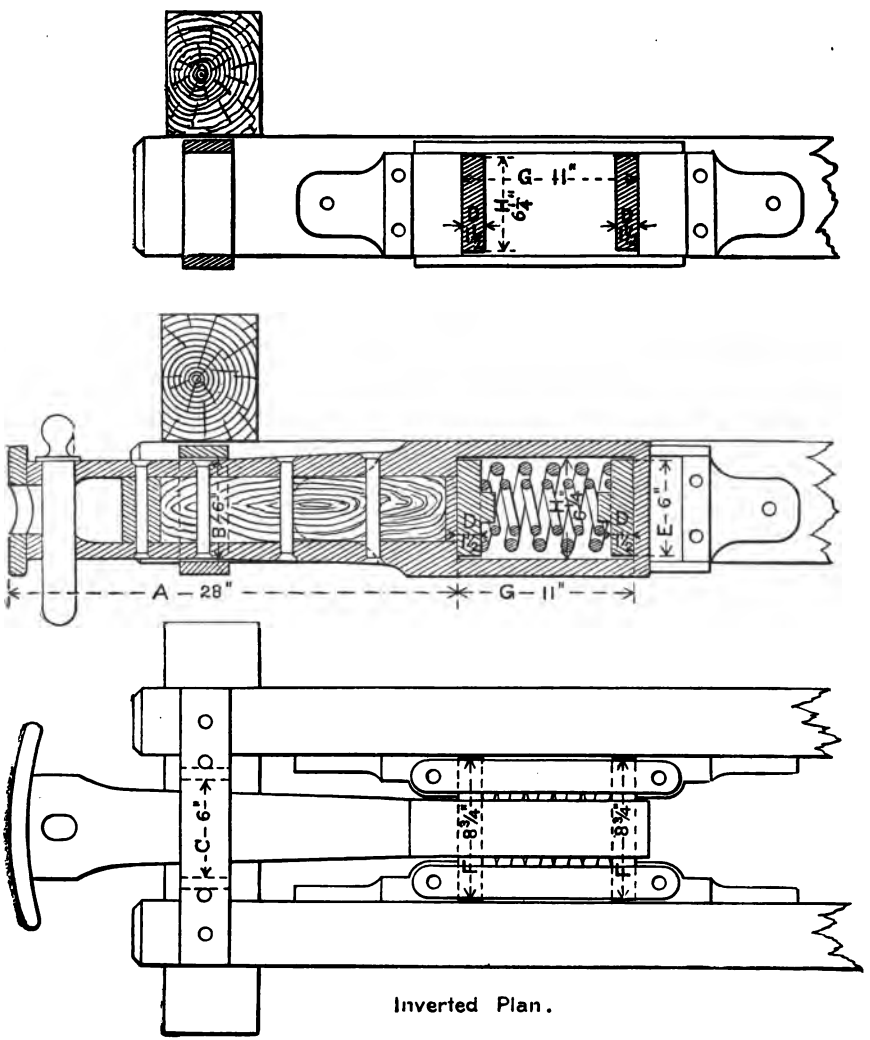
* There is evidently an error in the original report. It was Mr. Ford's amendment, and not Mr. Myers', which was adopted. The standard height recommended was 2 ft. 9 in.

Attachments of Draw-Bars.

The method of attaching draw-bars at their rear ends, shown in Fig. 11, was recommended at the Tenth Annual Convention, held in New York in 1876 (*see pages* 65 *and* 70 *of Report of that meeting*).



Inverted Plan.

Fig. 11.

Dimensions of Draw-Bars.

The following were recommended as standard dimensions for draw-bars at the Thirteenth Annual Convention, held in Chicago in 1879 (*see pages* 96, 98, 108, *and* 109 *of Report of that year*).

The length *A* (*see Fig.* 11), from the end of head to the first follower-plate to be 28 in.

The depth (*B*) at outer yoke in carrying-plate to be 6 in.

The width (*C*) for draw-bar, at carrying-plate or yoke, to be 6 in.

The follower-plates to be made of wrought iron, and rectangular in form, the thickness (*D*) to be $1\frac{1}{2}$ in.; the width (*E*) 6 in. and the length (*F*) $8\frac{3}{4}$ in.

The length (*G*) of the house of the draw-bar to be 11 in., and the width (*H*) $6\frac{1}{4}$ in.

The pin-hole in draw-bar to be made to take a pin $2 \times 1\frac{1}{2}$ in.

When a strap is used in back end of draw-bar, it shall have a clear space of 11 in. long and $6\frac{1}{4}$ in. wide. When a spindle is used, it shall be 2 in. diameter, 17 in. long from under side of head to outer edge of key; the key to be $2\frac{1}{2}$ in. wide and $\frac{1}{2}$ in. thick.

The draw-bars to be so placed in the cars as to locate the coupling-pins not less that five inches from the centre to the face of the dead-woods.

Capacity of Draw-springs.

At the same meeting (*see page* 100 *of Report*), it was recommended that the capacity of draw and buffer springs should not be less than 18,000 lbs.

DEAD BLOCKS.

The standard dimensions of dead-blocks, which were recommended at the Sixteenth Annual Convention held in Philadelphia in 1882 (*see pages* 45 *and* 47 *of report of that meeting*) are given in figures in the engraving, Figs. 12 and 13, and were amended at the Eighteenth Annual Meeting held in Saratoga, as follows:

Double dead-blocks are to be made 8 in. square on the face and 6 in. thick, and are to be placed 22 in. apart from centre to centre, and to have 14 in. space between them.

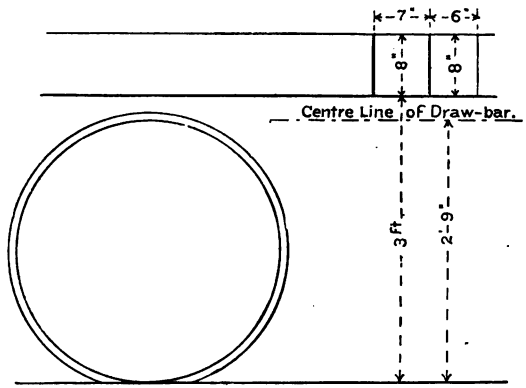


FIG. 12.

Standard Single and Double Dead Blocks

Recommended at the Convention of the Master Car-Builders' Association in Philadelphia, June 1882.

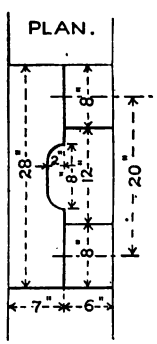


FIG. 13.

Single dead-blocks are to be not less than 30 in. long, 7 in. thick and 8 in. deep, measured vertically.

PROTECTION OF TRAINMEN FROM ACCIDENTS.

POSITION OF BRAKE-SHAFTS.

At the Thirteenth Annual Convention, held in Chicago in 1879, the following resolutions, having reference to the construction of the attachments to cars for the protection of trainmen from accidents, were adopted:

The attachments referred to are shown in Figs. 14 and 15.

Resolved, That this Association recommend that all brake-shafts be placed on the left-hand corner of the car, when a person is standing on the track facing the end of the car." (*See page* 85 *of Report of that meeting.*)

Fig. 14 shows the brake-shaft in the position designated.

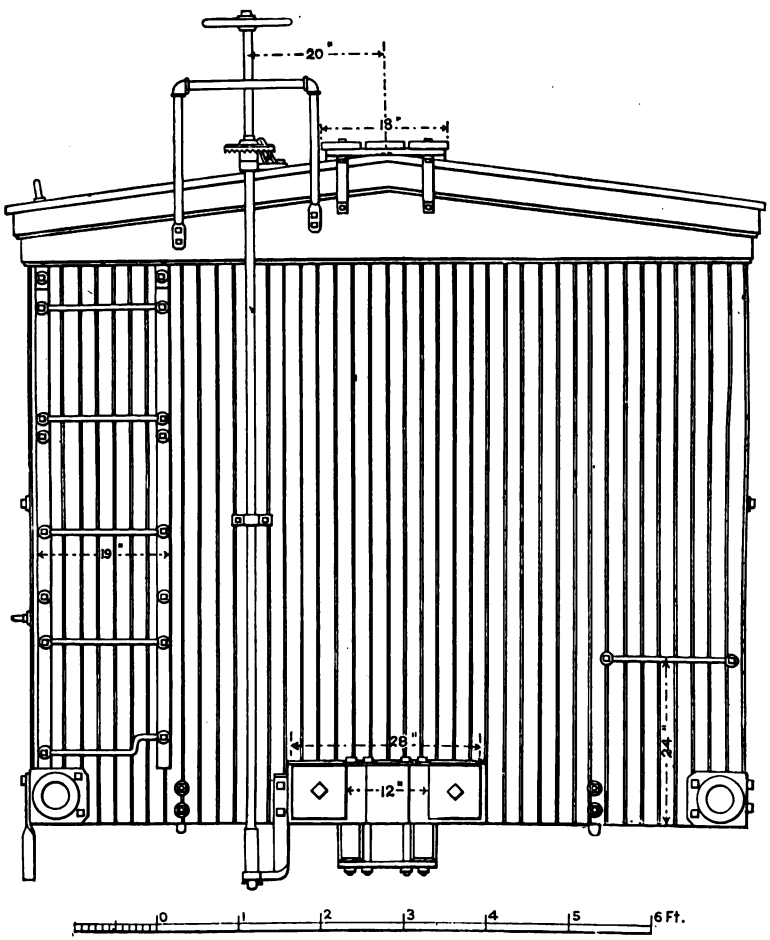


FIG. 14.

ATTACHMENTS FOR THE SAFETY OF TRAINMEN.

Brake-Steps or Platform and Fastening of Brake Ratchet-Wheel and Pawl.

[*See pages* 109 *and* 119 *of Thirteenth Annual Report.*]

"That the small platform placed at one end of freight cars, to fasten the brake pawl, etc., be discontinued, the rachet-wheel and pawl to be fastened to a suitable casting on the roof."

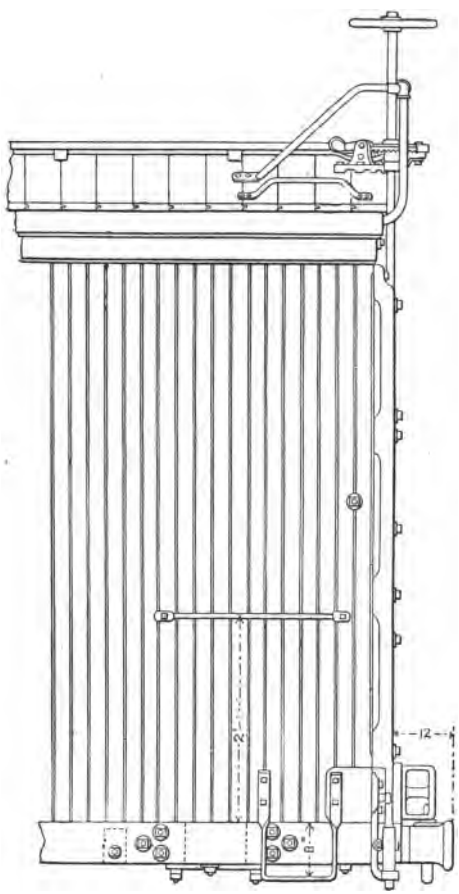


Fig. 15.

Running Boards.

[*See pages* 109 *and* 114 *of Thirteenth Annual Report.*]

"That the running-boards be not less than 18 in. wide and 1 in. thick, the ends of which to project $5\frac{1}{2}$ in. outside of the boarding, the projections to be supported by two braces made of 2 in. $\times \frac{1}{4}$ in. iron."

Steps.

[*See pages* 108 *and* 110 *of Thirteenth Annual Report.*]

"That two good substantial steps, made of wrought iron $\frac{1}{2} \times 1\frac{3}{4}$ in. be fastened, one to each side-sill, at diagonal corners of the car.

Ladder and Handles.

[*See pages* 109, 110 *and* 111 *of Thirteenth Annual Report.*]

"That each box and stock car have two ladders, not less than five steps in each ladder, made of $\frac{5}{8}$-in. round iron, projecting $3\frac{1}{2}$ in. from the siding, securely fastened to each end at diagonal corners, with a handle directly over the ladders, on the roof.

"Mr. C. E. Garey moved that the lower steps of the ladder have a guard or projection in order to prevent men slipping when swinging around the end of the car to get on the step.

"The recommendation as amended was adopted."*

CHECK-CHAINS.

At the Eighth Annual Convention, held in Cincinnati, in 1874, the following resolution was adopted (*see pages* 27 *and* 72 *of Report of that meeting*):

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* In a report on the Causes of Accidents to Trainmen made in 1883 (*see page* 28 *of annual report*) it was recommended by the Committee that "where ladders are on the end of the car a handle be placed horizontally about 24 in. above the lower edge of sill on side of car above the steps, to enable trainmen to get a firm hold before or while using the steps; also when the ladder is on end of car a handle should be placed on opposite corner from the ladder, and when ladders are on the side of car, two such handles should be placed on each end of the car about 24 in. above the bottom of sill, thus enabling train and yardmen to sustain themselves while making couplings, and which would be vastly beneficial should they stumble or otherwise loose their footing."

This report was "received" by the Association, but no other action was taken regarding the attachments which were recommended by the Committee, and are shown in Figs. 14 and 15.

"*Resolved*, That truck and car-body check-chains are, when properly applied, a valuable acquisition on passenger equipment, and your committee recommend their general use."

MARKING CARS.

A resolution was adopted at the Sixteenth Annual Convention (*see page* 158 *of Report*) requesting all railroad companies whose initials are the same as those of other railroad companies, to stencil the name of the road in full on some part of the car where it can readily be seen by freight agents.

STORING OF LINE CARS ON FOREIGN ROADS.

At the Seventeenth Annual Convention, held in Chicago in June, 1883, the following resolutions were adopted (*see page* 109 *of the Report of that meeting*):

"*Whereas*, It is a common practice to store line cars on side tracks during summer months or dull times away from home, after they have been in severe service; and,

"*Whereas*, Many of the cars after being so stored are found to be more or less out of proper condition, so that they need more or less repairs, and when put into service cause much detention to traffic and many transfers;

"*Be it Resolved, therefore*, That it is the sense of this meeting that all line cars owned by foreign companies should be returned to their owners instead of being stored on foreign tracks, and that a competent man should be detailed to inspect the stored cars and to arrange to have the necessary repairs made during the time such cars are out of service."

DICTIONARY OF TERMS.

At the Fifth Annual Convention, held in Richmond, Va., in 1872 (*see page* 18 *of Report of that meeting*), it was

"*Resolved*, That a committee be appointed with power to publish an illustrated book, defining the proper terms or names of each and every part used in the construction of railway cars, and a description of the use of the same."

At the Fourteenth Annual Convention, held in Detroit in 1880 (*see pages* 11 *to* 20 *of Report of that meeting*),

"The committee to whom was assigned the duty of preparing

a Dictionary of Terms used in the Construction of Cars submitted a copy of the book and reported that they had finished their work and were discharged."

ENTERTAINMENTS.

At the Ninth Annual Convention, held in New York in 1875, the following resolution was adopted (*see page* 113 *of Report of that meeting*):

"*Whereas*, The practice of entertaining the members of this Association by its friends has become an established custom, and has thus assumed somewhat the character of an obligation to which those who have so generously dispensed hospitality have, in a measure, felt themselves obliged to conform; and,

"*Whereas*, The expenditure of time and money for this purpose has in many cases been very much greater than the members of this Association have the right to expect should be devoted to their enjoyment; and,

"*Whereas*, The expense of such hospitality has in some cases been interpreted as having a significance which has been the cause of embarrassment to members;

"*Therefore*, We desire by this resolution, first, to express our thanks for the liberality of our friends in the past; and, secondly, to make the request in this public way, that in the future there shall be no more expenditure of money for the public entertainment of members of this Association."

The preamble and resolution were unanimously adopted.

Respectfully submitted by the

EXECUTIVE COMMITTEE.

THE SECRETARY—I suggest that the report be received and each recommendation taken up separately.

Agreed to. Before considering the report, letters from the Boston Hoosac Tunnel and Western Railroad, and the Saratoga and Mount McGregor Railroad were read proffering excursions to the members of the Association. On motion, the invitations were accepted, the time to be fixed and announced hereafter.

The first and second changes recommended by the Executive Committee were adopted. The third item was read.

MR. WALL said—I move an addition to that, "or 2 ft 11 in. when the car is empty."

Seconded.

MR. LENTZ—I move to amend making the height 2 ft. 10 in. when the car is empty.

Seconded.

MR. ADAMS—It seems to me, Mr. President, that 2 ft. 11 in. is quite an increase from 2 ft. 9 in. Ordinarily, springs will not settle 2 inches. It would depend altogether upon the kind of spring used—whether it will settle 2 inches. I think a provision ought to be made for the kind of spring used. If we use an elliptic spring, of course that will go down more than an ordinary coil spring.

MR. BISSELL—I suggest that it is very easy to control the height of the draw-bar when the car is empty, but it is very seldom that you will have a car loaded with the exact load. When we build a car, it is empty and we can arrange the height then very easily.

The amendment proposed by Mr. Lentz was adopted.

MR. WALL—I would ask if we can take this vote. Has not this got to be submitted to letter ballot ?

MR. CLOUD (in the chair)—No ; this is not on the adoption of a standard ; it is simply a revision of the old standards. As I understand the matter, the old standards were somewhat complicated, and it was not clear what was intended. This action of the Executive Committee was simply to say what they found to be the true intent of the Association. If this standard is to be changed, it must be brought up now. The question is on the original amendment. The motion is that the third section be amended as to whether it be 2 ft. 10 in. when the car is empty.

MR. LENTZ—It appears to me 2 ft. 9 in. when the car is loaded ought to be stricken out, and 2 ft. 10 in. when the car is empty, inserted.

MR. WALL—That would be a new motion entirely.

MR. MARDEN—I would like to inquire how this height of draw-bar has been understood, whether the members have understood it to be 2 ft. 9 in. when the car is loaded or 2 ft. 9 in. when the car is empty ; and how many have already placed their cars at 2 ft. 9 in. when the cars are light. It appears to me that it is very much better to keep the centre of gravity as low as you can. Every inch you raise the car carries the centre of gravity higher from the rails.

MR. KIRBY—I fully agree with Mr. Marden in his remarks, and I think we are going in the wrong direction in raising our cars. If I recollect, the original height as agreed upon at Richmond was 2 ft. 9 in., and nothing was said about loaded or unloaded. A car may have 10,000 lbs. in it and be loaded, or 60,000 lbs. in it and be loaded ; and while one load will compress the springs half an inch, another will compress them 2 inches—if we had any springs that would compress that much. I am entirely opposed to changing the original height of draw-bar—2 ft. 9 in., when the car is empty.

THE SECRETARY—I would like to ask Mr. Kirby whether there is any evidence that it was intended that the standard height should be measured when the car was empty. I have hunted through the reports to find out exactly what was meant by the original resolution, and I fail to find any record showing whether the height was to be measured empty or loaded ; and it was on account of that indefiniteness that it was specified here that it should be when the car is loaded.

MR. KIRBY—How are you going to gauge our cars when they are loaded ? The cars are not usually at the shop when they are loaded. When we send them out they are light, and that is the way we should understand the resolution, I think—2 ft. 9 in. when the car is light.

MR. MILLER—I move a reconsideration of that motion.

THE CHAIRMAN—The convention must first vote down the motion before the house before a new motion can be considered.

MR. MARDEN—I think this is an important matter, and one deserving of consideration. I think if the question is put to a majority of the members present, they will tell you they have been building their cars and putting their draw-bars at 2 ft. 9 in. when the car is light. If that is the fact, we have been going on in that way for a number of years, and for us to change the height of the draw-bar without giving due consideration to the subject is not doing justice to the railroad companies which we represent. I think it is a matter which we should consider carefully and vote on understandingly, and I, for one, should most decidedly object to making any change in the height of the draw-bars.

THE CHAIRMAN—You can dispose of the motion before the house in any way you see fit. The question now is, whether it shall be added to section 3, "or 2 ft. 10 in. when empty."

MR. ADAMS—It was undoubtedly understood by the generality of car-builders throughout the country, that the standard height, when the cars left the shop, was 2 ft. 9 in. Nineteen-twentieths of the cars that have been built since have been built 2 ft. 9 in. light. I would move, Mr. President, that this matter be laid on the table.

Agreed to.

MR. LENTZ—I move that the weight when the car is loaded to its full capacity be striken out, and let the resolution read, when the car is empty.

Seconded.

MR. VERBRYCK—I hardly think that motion is necessary at all. It was understood, I think, all through the country. I was not a member of the Association at the time the resolution was passed, but I have been building a great many cars since, and I understood that the height of the draw-head was 2 ft. 9 in., when the car was built. I think that the majority of our members have done the same thing. I do not think it is necessary to do anything about this.

MR. LENTZ—From the indications here to-day, I am inclined to think it is highly necessary that that should be stricken out and the words, "when empty" should be inserted. It is clear there has been a difference of opinion on this subject, and I see no reason why the words "when empty" should not be inserted.

MR. SNOW—My idea is that you had better let that whole business alone. We all understand it.

THE CHAIRMAN—I might state, for the information of some who have not followed the matter, that the record of the proceedings of the Convention is not perfectly clear, whether it means 2 ft. 9 in. when the car is loaded or empty, and this is simply a recommendation of the Executive Committee that it be construed as here printed. Now, if the Convention has usually construed it otherwise, of course they should reject the recommendation of the Executive Committee.

Mr. Lentz's motion was carried.

On motion of Mr. Davenport, Article 3, as amended, was adopted.

The Secretary read item 4, which, on motion of Mr. McKenzie, was adopted by a rising vote of 37 for to 7 against.

Items 5 and 6 were read and adopted.

Item 7 was read.

MR. McILWAIN—I would like to ask why this is proposed.

THE CHAIRMAN—I would state for the information of the Association that the reason why the Executive Committee recommends this change, is that it is found in using double dead-blocks with only twenty-eight inches between the centres, that they are too close together for the draw-head, although the draw-head is lower down. The flange of the draw-head in many cases interferes with the edge of the dead-wood, and that has been the reason why a number of railroads have not conformed to the standards in double dead-woods. If we had thirty inches instead of twenty-eight they could conform to the car-builders' standards, whereas they cannot conform exactly to the twenty-eight inches, and, therefore, they see no particular inducement to change their practice. With thirty inches between the centres there is plenty of room to make the dead-woods agree to this standard without interfering with the draw-head in any of its positions.

MR. ADAMS—You mean over all, do you not?

THE CHAIRMAN—Over all.

On motion of Mr. Adams, the residue of the recommendations made in the report were adopted.

THE SECRETARY—I would call the attention of the Association to a resolution which will be found on page 96, and which reads as follows:

"Resolved, That a committee be appointed to prepare a circular calling the attention of railroad managers to the standards and the appliances for the safety of trainmen."

That was amended on page 101, where Mr. Raymond said: "I would move to amend by adding, which have been recommended by the Association, and that this Committee be urged to do everything in their power to secure their adoption." That matter came up for consideration by the President and myself, and we determined that it would be unwise to appoint such a Committee, owing to the fact that the standards would come up for revision at this meeting, and we could hardly urge the railroad companies to adopt standards which, by our own confession, were not correct. But since the standards have been revised, it would be right that a committee should be appointed to take such action.

MR. KIRBY—I think I was appointed as the Chairman of that Committee, or rather, I was appointed as such Committee, with power to select my associates; and it was in view of the statements made by Mr. Forney, just know, that I did not take any action in the matter. I said to myself: "Some are advocating a 25-ton car, others a 30-ton car, and some go on up to 50 and 60. Now, how can we recommend standards, when there is such a diversity of opinion as to the capacity to which we should build our cars"? And it was with that view in mind that I remained inactive as a Committee to prepare that circular.

THE SECRETARY—In order to bring the matter before the Association, I move that a Committee be appointed to perform the duties named in this resolution.

Agreed to.

MR. McKENZIE—It is understood now that when this Committee are appointed they are to go on and recommend, not knowing what to recommend.

THE PRESIDENT—We have our standards now as amended.

MR. McKENZIE—Does that cover these resolutions?

THE PRESIDENT—It covers those resolutions adopted.

MR. McKENZIE—That covers the capacity of cars and everything else, I suppose ?

THE PRESIDENT—There is no reference to the capacity of cars in the standards which have been adopted.

The time has now arrived for the discussion of questions.

THE SECRETARY—No questions have been presented to the Secretary. The following communication from the Secretary of the Board of Railroad Commissioners of the State of New York has been received :

STATE OF NEW YORK,
BOARD OF RAILROAD COMMISSIONERS,
ALBANY, June 3, 1884.

M. N. Forney, Esq., Secretary of the Master Car-Builders' Association, No. 73 Broadway, New York City :

SIR—I am instructed to forward to the Master Car-Builders' Association the communication of Benj. Douglas, Jr., Esq., inclosed herewith, with the request that it will take cognizance of the suggestion, examine into the matter, and report upon the same to this Board.

Very respectfully,
WILLIAM C. HUDSON,
Secretary.

The following is a copy of the letter inclosed :

LAW AND COLLECTION DEPARTMENT OF
THE MERCANTILE AGENCY,
R. G. DUNN & Co.,
312, 314 AND 316 BROADWAY,
NEW YORK, May 30, 1884.

To the Honorable The State Commissioners of Railroads, Albany, N. Y. :

GENTLEMEN—I was a passenger on the St. Louis Express, which collided with a freight train at Brighton Junction,* on the night of May 22.

I would suggest for your consideration the advisability of having a trap-door placed in the top or bottom of every sleeping-car. If this accident had occurred in winter, in all probability many passengers would have been burned to death before assistance could have been given them. Four of the sleepers left the track and fell upon their sides, and in order to liberate the occupants it was necessary to cut holes in the roofs of the cars, and it was fully fifteen minutes after the accident occurred before the Japanese Prince and his suite were rescued.

Yours very respectfully,
BENJ. DOUGLAS, JR.

THE SECRETARY—This correspondence was submitted to the Executive Committee last night, and they adopted a resolution that the letter of the Commissioners be submitted to the Convention for discussion.

THE PRESIDENT—If it is the pleasure of the members, I would invite any person connected with the Wagner or Pullman Car Companies, if present, to make suggestions on this subject.

No suggestions were offered.

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* On the New York Central and Hudson River Railroad.

THE PRESIDENT—If no one has anything to offer on the subject of trap-doors in the roofs or floors, I would suggest that you have a Committee appointed whose business it shall be to report on that subject during Thursday's session.

MR. McILWAIN—I move that a committee of three be appointed.

Agreed to.

THE PRESIDENT—I appoint as that committee, Messrs. F. D. Adams, R. C. Blackall and Sanford Keeler.

MR. ADAMS—I beg to be excused, Mr. President.

THE PRESIDENT—I don't think I can excuse you.

MR. ADAMS—If you want any work done on that committee do not appoint me.

MR. BLACKALL—We are perfectly willing to act if Mr. Adams is Chairman of the Committee.

MR. ADAMS—I am not willing to act with you or with any one on that Committee.

THE PRESIDENT—I think, Mr. Adams, if you would consent to serve you would convey the idea that you are not afraid of the subject.

MR. ADAMS—The reason that I have for refusing, is because I think the proposal is utterly useless. I do not think there is any need for holes in the top or bottom of the car; and I do not think it would be worth while to appoint a person who is so indifferent about the matter. Appoint some man who takes an interest in it. Such a person would investigate the subject fully.

MR. CLOUD—I think if we had members here who were on the car or on the train mentioned in the letter that they would be interested in it. The matter is presented by the Railroad Commissioners of the State of New York. They have received a communication on the subject from a gentleman who was on the train, and I think we ought to take some action upon it. When a car is on its side, and one window is above your head and the other beneath you, it would be very satisfactory if you had a hole out of which you could get. I think we should have a willing committee; one that would regard a recommendation coming from the Railroad Commissioners as worthy of consideration.

MR. ADAMS—I think Mr. Cloud is right. We should pay attention to the Railroad Commissioners of the State of New York, or any other State. It is an honor paid to us, and I favor the idea of a committee; but I do not think it should be composed of persons who would not take an interest in the subject. In our State we provide axes and saws on the inside of the cars to cut holes through them, but we have never had any occasion to use them yet. We do not want to put holes in the roof with the effect of rendering useless the tools that we have gone to the expense and trouble of putting in.

MR. McKENZIE—I would like to ask Mr. Adams whether he screws on his axes and saws so tight that it requires another axe to cut them off? I have seen them fastened up in that way so that they could not be taken down.

MR. ADAMS—I should say that it was a very inhumane act to screw them so that they could not be got loose. They are fastened simply by a leathern strap so that anybody who has a jack knife can cut them off. There are tools also on the outside accessible at any point or any position.

MR. McILWAIN—Even if that Committee were opposed to having a trap-door, they could say to the Railroad Commissioners what their opinion is in that regard.

THE SECRETARY—The following question has been handed to me: "What is the best method of preserving finished axle journals from rust before they are put in service?"

MR. KIRBY—I do not think that our plan is the best, but I will state what we use. We use white lead and oil. It is put on immediately after the wheels are pressed on to the axle by the man who presses them on.

MR. KEELER—If that should not work well I would suggest painting them red. (Laughter).

A MEMBER—I think white lead and tallow would be an improvement on white lead and oil.

MR. VERBRYCK—We use the same as Mr. Kirby has described, white lead and oil. I know of nothing better.

There was no further discussion on this subject.

MR. DAVENPORT—The impression prevails that all the mentioned standards in the report of the Executive Committee have been adopted, embracing the form of flange and tread of wheel, which was submitted to a letter ballot, which I learn from the Secretary was rejected. Now there may be a misapprehension in the minds of some, and I think we ought to be clear on that point.

MR. LENTZ—I think it would be a good idea if the Secretary were to read the questions which were submitted to letter ballot, and state which were and which were not adopted.

THE SECRETARY—If Mr. Davenport will refer to page 128 of the last annual report he will see that the last paragraph states that the form of tread and flange shown by the engraving was *not* recommended. The engraving that he refers to was inserted there simply to show the point at which the diameter of the chill mould should be measured.

MR. DAVENPORT—I would like to inquire whether any reasons were assigned by those voting against this form of wheel.

THE SECRETARY—There were none. The ballots were simply "yes" or "no."

MR. BLACKALL—I would like to inquire how the votes stood.

THE SECRETARY—Mr. Blackall will find the statement of it under the head of letter ballots on page 118 of the Annual Report.

MR. DAVENPORT—This is a matter of very great magnitude, and perhaps there is no other matter coming before us at this convention in which the railroads of the country have so much at stake as in the matter of an improvement, if possible, in the manufacture of cast-iron car-wheels. Because whatever may be said of the steel-tired wheels which we use under our passenger coaches we cannot think that the day is near when steel-tired wheels will be used under freight cars; and inasmuch as we use so many more chilled iron wheels than any other it seems to me that the form of flange and tread which shall give the best possible results in the estimation or experience of this convention, is a very grave and important matter. When this form was rejected I confess that I was decidedly in favor of it, but after making, perhaps, ten thousand wheels of that form we discovered a difficulty.

THE PRESIDENT—If Mr. Davenport will allow me to interrupt him I will say that the subject will come up at to-morrow morning's session, when we expect to have a very able paper presented with some recommendations.

MR. DAVENPORT—All right; I am very glad to hear that.

THE PRESIDENT—If there are no other questions new business is in order.

THE SECRETARY—I would say that at the meeting of the Executive Committee last evening there was brought up the question of the propriety of remitting the dues of Mr. Baker and Mr. Lightner, who are both among the oldest members of the Association. Mr. Lightner I believe is now quite old. He says that he is no longer able to attend the meetings; and Mr. Baker is, I believe, the oldest car-builder in the Association, perhaps in the country. It therefore seems fitting that their dues should be remitted. Will some member offer a resolution to meet the case?

MR. WALL—I move that their dues be remitted.

Carried unanimously.

THE SECRETARY—I will also say to the Association that the Executive Committee last evening had under consideration the question of posting the names of members who are in arrears for their dues at the annual convention; and it was agreed to submit the question to the Association. It is the practice in all clubs and all associations of this character, that when the members are in arrears, their names are posted with the amount of dues unpaid. It would seem a proper matter for the consideration of members here. Due notification should of course be given to the delinquent member before the annual convention so that he would have a chance to pay up.

MR. LENTZ—I think the Secretary has a resolution on that subject.

THE SECRETARY then read the following resolution:

Resolved, That the Secretary be instructed to post in the meeting-room of this Association during each annual convention a list of the members who are in arrears for dues, with the amount of their indebtedness.

THE SECRETARY—I hope as it will be the duty of the Secretary to post this list that any members who have any objections to this measure will express them, as it is a somewhat delicate matter.

MR. ADAMS—Suppose, Mr. President, that some member should make up his mind, in the course of a year or two, that he would withdraw, would it be necessary to keep his name posted there for three years, or would it be dropped from membership and his name left off? The circumstances might be such that he might say, I will not pay my dues this year, I will withdraw from the Association. Now, would it be necessary, if this resolution was passed, to post that man's name for three successive years; or, would the name be left off, and the man considered not a member?

THE PRESIDENT—A member resigning would not be considered a member.

The resolution was adopted.

The report of the Committee on Sharp Flanges was called for.

THE SECRETARY—There is no report from that Committee in the hands of the Secretary.

MR. GOODWIN—I would ask a little time in regard to that. I arrived here only this morning, and had an opportunity to confer with the other members of the Committee only to-day. We will report to-morrow.

THE PRESIDENT—Is the report on standard freight and passenger car trucks, ready?

THE SECRETARY—The report is in the hands of the Secretary, and is printed.

The Secretary then read the report.

REPORT OF COMMITTEE ON STANDARD FREIGHT AND PASSENGER TRUCKS.

Your committee have examined the freight-car trucks in general use in the United States and Canada, and do not yet find any which are sufficiently satisfactory to recommend to you as a standard.

In addition to the recommendations made in our last report, we now suggest a uniform spread of five feet from centre to centre of wheels.

We also think it important that a truck for heavy loads and high speed should allow a free vertical motion of the box so that the stresses (produced by the blow of the wheel striking the joints and frogs) are not communicated directly to the truck frame. This implies either boxes working on pedestals or the side-frame, independent of the cross-frame. We present designs in which each of these conditions are embodied.

The use of cast-steel having a tenacity superior to wrought-iron and equal ductility renders it possible to design a truck which shall have correct shape for strength, with minimum weight and least number of separate parts.

A solid pedestal frame made of this material is not objectionable on account of numerous separate castings, bolts, etc., as all other pedestal trucks *are*.

We have designed two trucks which show how a steel casting may be used for a truck frame.

Plate I. shows a solid steel frame 5 ft. spread, with equalized and half elliptic springs. The pedestals, brackets for cross frame, brackets for brake-beam hangers, and the side bearings, form *one* casting. The bolster is rigid and made similar to the tender trucks of the West Shore Railway. The brake-beams are similar to those designed by Mr. George Westinghouse, and described in his letter attached to our last report. The brake gear is adapted to the automatic train brake.

The wheels are shown 36 in. diameter, but either 33 in. or 36 in. may be used. The axle has collarless journals 4 in. $\times$ $8\frac{1}{2}$ in., wheel seat $5\frac{1}{4}$ in. and diameter at middle $4\frac{1}{2}$ in.

The box has the Fletcher lid, and good dust guards, made of leather, secured between two thin boards.

This truck would be expensive, but we believe it would be well suited to cars of large capacity for high speed. It would be economical in repairs, and would produce little injury to the car body and track.

Plate II. shows another form of solid steel frame with pedestals, and spiral springs directly over the journal-box. In this plan the car body is suspended from hangers on a rigid cross frame, and can swing laterally or longitudinally. The wheels, axles and boxes are similar to those shown in Plate I.

Plate III. shows a diamond truck in which the cross-frame is independent of the side frame, and in which the same suspension principle is used as in Plate II. The wheels, axles, etc., are similar to Plate I.

We have thus endeavored to satisfy the advocates of both rigid and swing centre trucks—those who favor diamond trucks and those preferring pedestals, and it remains for you to decide which *principle* shall be adopted.

The plans are not presented for your adoption, but we believe they contain elements which may assist in the design of a truck which the majority of you will find satisfactory.

We do not think it important that a standard passenger truck be adopted, and this part of the subject should hereafter be omitted. The only passenger cars which frequently pass over different lines are sleeping cars and special cars. You may think it desirable to make some effort to secure uniformity in the wheels, axles, boxes, bearings, pedestals and brake-shoes of such cars, and if so, it should form the subject for another committee.

In conclusion, we recommend that a new committee on Standard Freight Trucks be appointed, so that this important subject may be considered from a new point of view, and that your best talent be selected for the committee.

ROBT. MILLER,
WILLIAM FORSYTH,
WILLIAM MCWOOD,
} *Committee.*

MR. MILLER affixed some blue prints to the blackboard, and explained them.

The Convention then adjourned until the following day.

SECOND DAY'S PROCEEDINGS.

The Convention was called to order at 10 A. M.

On motion, it was agreed to dispense with the reading of the minutes of the previous day's session.

THE CHAIR appointed as a Committee to present a place for holding the next annual meeting, D. C. Richardson, John Hodge and R. W. Bushnell.

THE SECRETARY said that a resolution had been adopted at Philadelphia authorizing the purchase of a standard two-foot bar. The order for this was given to the Pratt & Whitney Company, of Hartford, Conn., and the standard bar was now completed, and is now before you. Mr. George M. Bond, of the Pratt & Whitney Company, is present, and, with your consent, will describe to you the standard bar which is now the property of the Association.

MR. BOND—This bar, which is now delivered to the Master Car-Builders' Association, is a steel and line measure standard. It is engraved on one side, "Line Measure, 24 inches, Standard at 62° 0' F.," and signed by Wm. A. A. Rogers, by whom the transfer and subsequent investigation was made. On the other side is engraved, "End measure, 24 inches, Standard, made by the Pratt & Whitney Company, Hartford, Conn., for the Master Car-Builders' Association, June, 1884."

An explanation is due for the tardy appearance of this standard, it having been ordered just two years ago. This delay was caused by the time required to complete a long series of comparisons necessary to ensure an accurate transfer, Professor Rogers having obtained, through the co-operation of Dr. Chaney, Warden of the Standards at London, a line measure transfer of the British Yard, exactly two-thirds of which this bar now represents.

This bar is a standard which is hardened at each end, and has a section such as will insure rigidity when in its normal position, the line measure uppermost.

The lines are ruled with a diamond, on the highly polished surface of the ends of the bar, just above the surfaces which define the end measurer. These lines are graduated in bands of three lines, each line separated from the others of the same band by a space of $\frac{2}{1000}$ of an inch. The three lines are thus made plainly visible to the eye, and for delicate tests the edge of the middle line may be used as stated. There in no correction at 62° F.

End measure may be compared directly from the standard bar within any desired limit of accuracy.

THE PRESIDENT—I would request any gentlemen who have charge of the permanent way to be kind enough to hand their names to the Secretary. Mr. Forney will now read the paper he has prepared for this occasion.

MR. FORNEY—I feel that I ought to make an apology for the length of this paper, and I will do so by relating a story that is told of Mr. Beecher. When he was preaching in the Western country, some of his congregation remonstrated with him for saying so many funny things in his sermons; and he replied that if they only knew all the funny things he did *not* say they would not complain of those which he did say. Now, if the gentlemen of the Association knew how much material connected with this subject I do not bring forward, they would, perhaps, be willing to excuse the length of this paper.

MR. FORNEY then read his paper on

THE RELATION OF RAILROAD WHEELS AND RAILS TO EACH OTHER.

At the last Convention of this Association a committee submitted forms for the treads and flanges of cast-iron and steel-tired wheels, with the recommendation that they be adopted as standards. They were, therefore, submitted to the Association for approval by letter ballot, but neither of the forms received two-thirds of the votes cast, which the constitution requires before any standard can be adopted by the Association.

The question of a standard form of tread and flange, therefore, stands as it did before the committee made its report. As it seemed to be of the utmost importance that some action should be taken looking to the adoption of a standard, and that this should be done as early as possible, it occurred to the writer that, if the principles which should govern the form of the flanges and treads of wheels were carefully investigated and explained, it might help to secure the adoption of a standard which would be in every way satisfactory. It was with that object in view that the following paper has been prepared. It may be added that while a standard tread, flange and gauge of wheels is important, a standard for the shape of the heads of rails where they come into contact with the wheels and for the gauge of track, guard-rails, frogs, etc., is equally so. A little investigation showed that there was a great diversity in the practice of laying track on different roads, and, therefore, the following circular of inquiry was sent to the managers, engineers of permanent way, and master car-builders of all the railroads in North America, to ascertain definitely how much difference actually existed between the practice on different roads:

Master Car-Builders' Association.

CIRCULAR OF INQUIRY FROM THE SECRETARY WITH REFERENCE TO THE GAUGE OF TRACK, LOCATION OF GUARD-RAILS, ETC.

73 Broadway, New York, April 1, 1884.

Sir—The Master Car-Builders' Association has under consideration the adoption of a standard for the gauge of car-wheels, and for the form of their treads and flanges. Before taking final action with reference thereto, it is desirable that reliable information should be obtained regarding the prevailing

practice in laying track, locating frogs, guard-rails, etc., on the different roads of the country. Investigations which have been made have shown that the differences in the gauge of car-wheels on various roads are so great as to be an obvious source of much danger, and, it is believed, a prolific cause of accidents. Inquiry has indicated that similar discrepancies exist in the laying of tracks, the location of frogs, guard-rails, etc.

That there are some very serious defects in the railroad practice of this country is indicated by the large number of derailments which occur here. During the five years previous to 1883 there were 5,337 accidents reported in the *Railroad Gazette* record, of which 3.545, *or over* 66 *per cent.*, were derailments. During the same period 5,191 accidents were reported to the Railway Department of the British Board of Trade, of which only 410, *or less than* 8 *per cent.*, were derailments. These figures become still more significant when it is remembered that the British statistics are collected by authority of the government, and are probably very nearly correct, whereas the *Railroad Gazette* record is made up chiefly from reports gathered from the newspapers, and probably includes only a small proportion of all the derailments which occur in this country, as these are seldom reported in the newspapers, unless some serious injury to persons or property is caused thereby. The great difference in the number of accidents of this class which occur here, compared with those reported by the Board of Trade, is no doubt due in some degree to the superior condition of the permanent way of British roads; but the disproportion is so great that there must be some other grave defects in our lines, or in the rolling-stock, or probably both, to cause so many more accidents of this kind here than occur on the foreign lines.

The purpose of this circular is to collect definite information with reference to this subject, to guide the Master Car-Builders in establishing a standard for the gauge of wheels. Therefore, by answering the following questions, or instructing the proper officer to answer them, you will assist the members of the Car-Builders' Association in making the standard gauge for wheels conform to that of the rails on which they must run :

1. What is the gauge of the track of your road ?

2. Do you measure the gauge at the point *A* or *B* on the rail,* shown in Fig. 1 ? (Plate IV.)

3. How much space do you give on tangents for flange-way between the guard-rail and main-rail, as indicated at *N*, Figs. 3 and 4 ? (Plate IV.)

4. How much space do you give for flange-way at *M*, between the frog-point and wing-rail ?

5. How much at *T*, in the throat of the frog ?

6. Do you measure the flange-way between the points *A* or *B*, Fig. 1 (Plate IV.), on the rails ?

7. Do you either widen or narrow the gauge on tangents at *G*, Fig. 3 (Plate IV.), opposite to the points of frogs ? if so, how much ?

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* If the sides of the heads of the rails are vertical, and not inclined, as in the engraving, it of course makes no difference from what point on the side the gauge is measured, but if the side of the head is inclined, as in the engraving, there will be a material difference in the gauge if measured at *A* from what it would be if measured at *B*.

8. Do you either widen or narrow the gauge of turn-outs, at *F*, opposite to the points of frogs? if so, how much?

9. How much space do you give on turn-outs for flange-way, at *A*, between the turn-out-rail and guard-rail?

10. How much at *L*, between the frog-point and wing-rail?

11. Do you make any change in the gauge of track opposite to frogs when they are laid on either the inside or the outside rails of curves on main line?

12. How much space do you give at *N* for flange-way between the guard-rail and main-rail when frogs are laid on curves?

13. How wide do you make the gauge of switches at *H*, Fig. 5? (Plate IV.)

14. How wide do you make the gauge of main track at *R*, Fig. 5, in front of switches?

15. How much throw do you give to split switch-rails, as indicated at *X*, Fig. 5?

16. What is your rule for widening the gauge on curves of main line?

17. What is your rule for elevating the outer rails on curves above the inner rails?

It would also assist in this inquiry if you would send the Secretary of the Master Car-Builders' Association a tracing, or blue-print, similar to Figs. 1 and 2 (Plate IV.), showing the standard rail-section and fish-plates which you are using on your road.

This subject is of such great importance to the railroads and to the public in this country, that it is hoped the officers of railroads to whom this circular will be sent will either answer it themselves *or refer it to the proper person, with instructions to send the desired information as promptly as possible to*

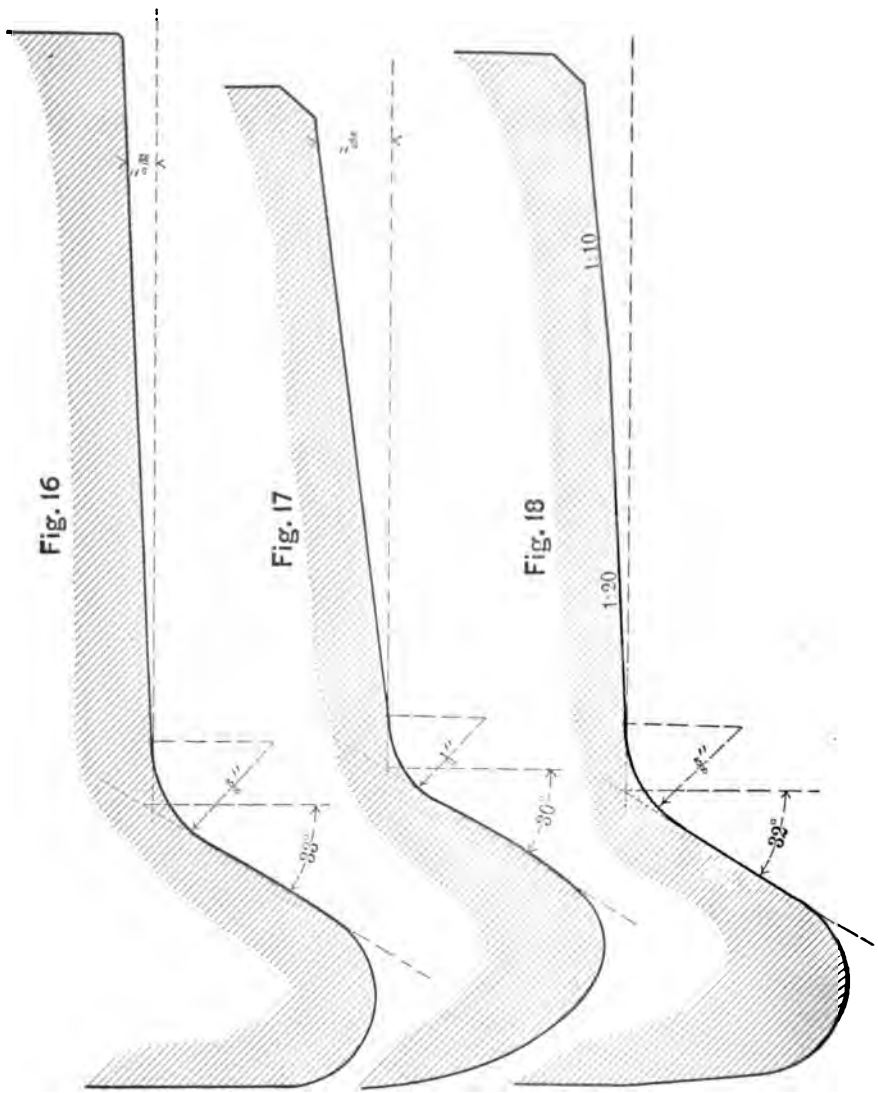
M. N. FORNEY,
Secretary of the Master Car-Builders' Association,
73 Broadway, New York.

Give name of road here.....

Give signature here.....

The replies to this circular have been tabulated (see Plate V.), and show how great the differences in laying track really are. When the subject was presented to the Executive Committee of your Association it was determined that a conference meeting for the discussion of this subject, to which representatives of the permanent way departments of the various roads should be invited, might help in bringing about a better mutual understanding with reference to the gauge of track and wheels, more uniformity in the practice of those having charge of the car and permanent way departments, and possibly the adoption of standards in each, which would be consistent with each other. The Executive Committee, therefore, instructed the

secretary to issue an invitation to railroad companies to send representatives of the permanent way department of their lines to this meeting of the car-builders for mutual discussion and conference. With this preliminary explanation, and without other introduction, the discussion of the subject of this paper will be taken up.



Figs. 1 to 15, Plate VI., represent the shape of the treads and the flanges of cast-iron wheels made by as many different manufacturers of such wheels, and Figs. 16 and 17 represent sections of steel tires used by prominent manufacturers of steel-tired wheels in this country, and Fig. 18 represents the standard section of tread and flange used on the German State railroads. In Fig. 19 the form of rail-head used on the New York Central Railroad

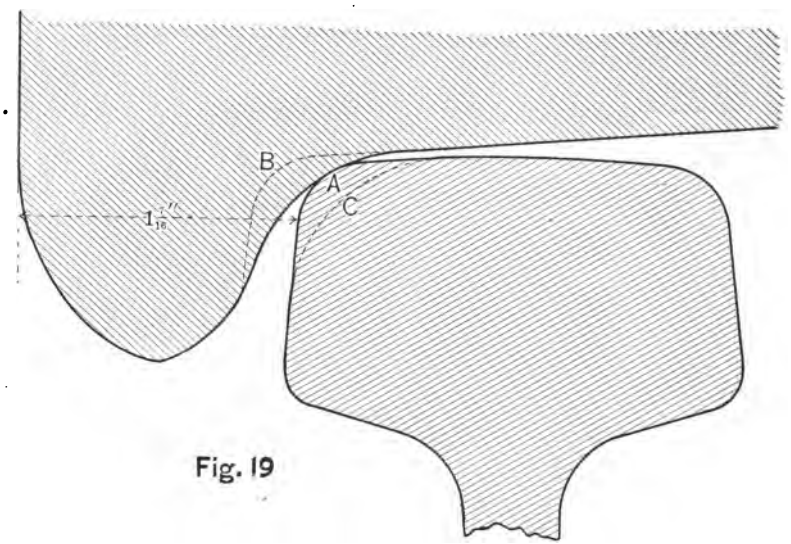


Fig. 19

is shown, with the tread and flange, represented by Fig. 12, of Plate VI., drawn on top of it, in the position it would occupy on the outside of a curve. The relation which the one bears to the other is thus shown clearly, and it will be seen that the load carried by the wheel is supported on the corner of the rail at A, and that the very small surfaces in contact must resist not only the weight carried, but the lateral pressure of the flange due to the curvature of the track. It is obvious that under these conditions the wheels will be worn so as to conform to the shape of the rails, as indicated by the dotted line *B*, and that the rails will be worn so as to conform to the shape of the wheels, as shown by the dotted line *C*. Fig. 20 represents the steel tire shown in Fig. 17, on the New York Central rail-head. Fig. 21 shows the Pennsylvania Railroad tread and flange on the standard rail used on that road. These figures show that the rails do not conform to the shape of

the throats of the flanges, and that the surfaces of wheel and rail in contact are very small.

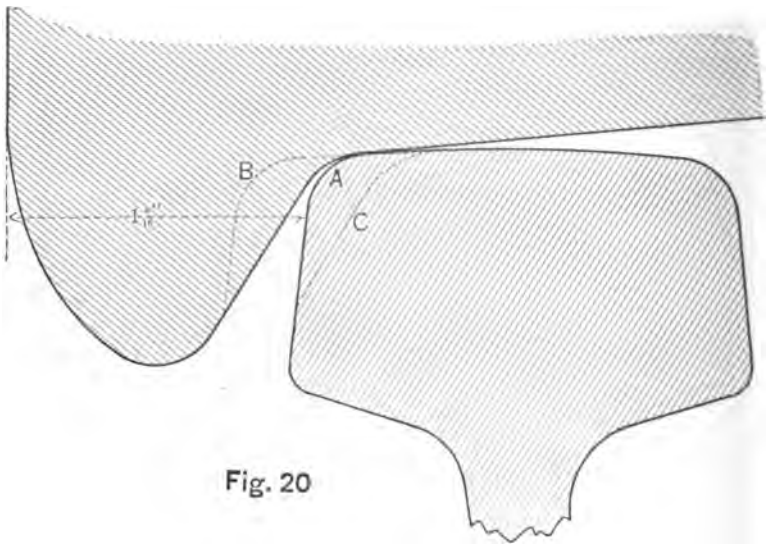


Fig. 20

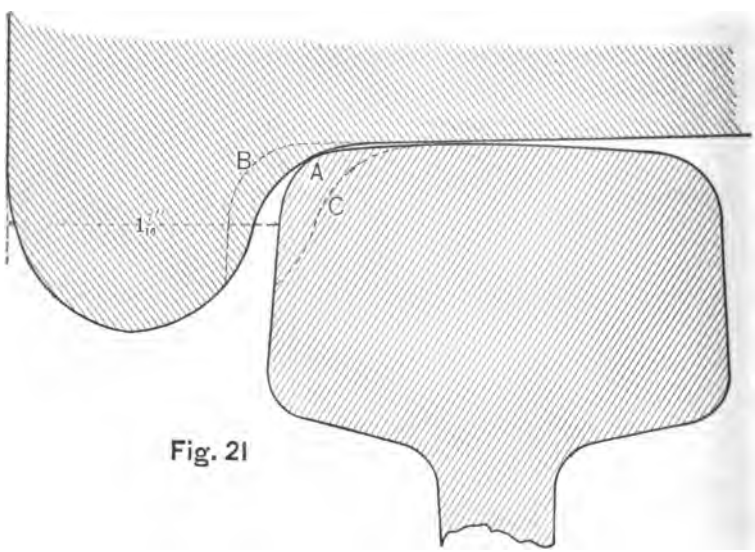


Fig. 21

In Fig. 22 the standard tread used on the Reading Railroad is shown on the rail laid on the Lehigh Valley line. In this case the corner of the rail does not touch the throat of the flange, but

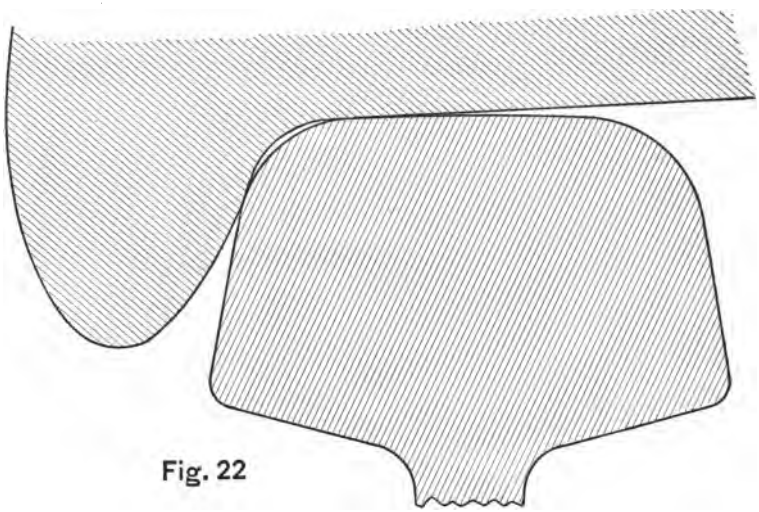


Fig. 22

the wheel bears on the top of the rail and the face of the flange comes in contact with the side of the rail-head.

Probably very few, if any, rail sections at present in use, would fit the sections of treads and flanges shown by the engravings. In some cases the difference in their forms would be very great, as has been shown. We have the curious condition of things, that the forms of rails have been designed by one set of men, and the wheel-treads and flanges by another, apparently without any reference to each other.

The length of the lines in contact at *A*, in Figs. 19 and 20, is approximately $\frac{3}{16}$ in. It is not easy to determine what the length of the surfaces in contact would be with an ordinary 33-in. wheel, but it is certainly not over $\frac{3}{4}$ in. The bearing surface would then be of an elliptical figure, with the major and minor axes of dimensions not exceeding those named, the area of which would be only about an eighth of a square inch. As the maximum weight carried by car wheels is now from 5,000 to 8,000 pounds, these bearing surfaces must be subjected to pressures of from 40,000 to 64,000 pounds per square inch. It is therefore not surprising that they are rapidly worn away, as there is no principle in mechanics more firmly established, or more certain than that the wear of surfaces in frictional or rolling contact is in an inverse proportion to their area. Therefore if we should increase the area of the surfaces of the wheel and the rail, which are

in contact, the capacity of both for resisting wear will be increased. To do this their forms must be made to conform to each other. In other words the treads and flanges of wheels should be made of the same shape as the heads of the rails. Thus, in the case of a

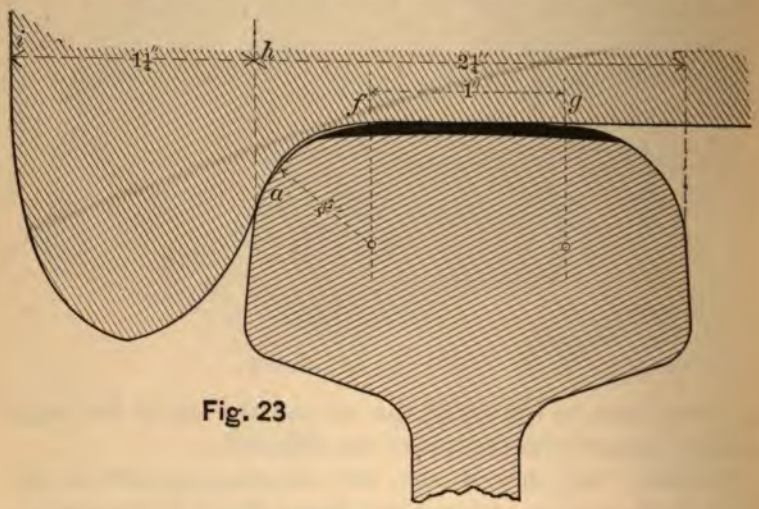


Fig. 23

rail of the shape shown in Fig. 23, the corner of which is curved with a radius of $\frac{5}{8}$ in., the tread and flange should also have the same curve so as to coincide with that of the rail as shown. If the radius of the corner of a rail is $\frac{11}{32}$ in., like that shown in Fig. 24, the throat of the flange must also be $\frac{11}{32}$ in. in order that the two may fit each other. But here comes in a difficulty. The wheels of one road must often run on the rails of another line and unfortunately the shapes of the rails differ as much, or more than those of the wheels. The curves, which form their corners, vary all the way from $\frac{5}{8}$ in. radius to $\frac{5}{16}$. There is no uniformity, but infinite diversity in this particular. If a flange is made to fit the rail illustrated in Fig. 23 it will not fit that one shown in Fig. 24, and *vice versa*. It will thus be seen that before we adopt a standard for the treads and flanges of wheels we ought to have one for rails, or at least for the portion of the rails which come in contact with the wheels.

It may then be asked at once whether it would be best to make the rails and treads and flanges as shown in Fig. 23 or as in Fig. 24. In other words should the corner of the rails and the throat, as it is called, of the flange be curved with a radius of $\frac{5}{8}$ in. or is

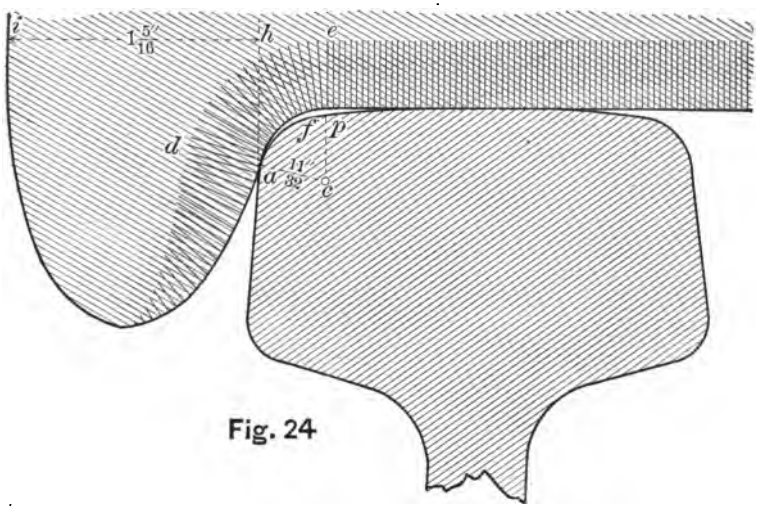


Fig. 24

$\frac{11}{32}$ better. If the latter dimension is proposed for wheels car-builders will object that with so sharp a corner the flange is weakened where it is most liable to break, and there will be very little metal in the throat to resist the lateral wear of the flange against the rail, and, if the flange of a cast-iron wheel is made of that form, it will be difficult to get a good chill in the throat. As little is known of the real cause or theory of chilling, no reason can now be assigned for this with any certainty that it is the correct one. An examination of a broken chilled wheel shows, however, that the chill extends at right angles from the surface of the tread in what may be called striated lines, as indicated in Fig. 24. This effect is due, probably, to the sudden cooling of the melted iron by the chill-mold, with which it comes in contact. It may be imagined that the heat in the melted iron is transmitted to the mold in the most direct course possible, as indicated by the lines. It will be noticed that at the throat, opposite to *f*, those lines are radial to the curved surface and consequently diverge as they extend into the mass of metal, and converge if they are extended outward into the chill-mold. Therefore the portion of the mold included in the small section *a c p* must absorb the heat from the metal included in the surface *a d e p*. The shorter the radius *a c* the smaller will be the area of the sigment *a c p* and the greater the disproportion between it and the surface *a d e p*, and consequently the greater

the difficulty of chilling the metal included within that area. It is owing to this difficulty that wheel-makers generally object to a reduction of the length of the radius of the throats of wheels. The most common length in use is probably $\frac{5}{8}$ in., although the average length of those represented in Figs. 1 to 15 is somewhat over $\frac{11}{16}$ in. If we adopt a radius of $\frac{5}{8}$ in., which is the least that seems to satisfy a majority of the wheel-makers, and then make the rail to fit it, as shown in Fig. 23, which represents a rail rolled by the Scranton Steel Company, we encounter the objection that the top surface of the head of the rail, which is the portion that bears the load, is narrowed too much. Thus the two rails shown in Figs. 23 and 25 both have heads $2\frac{1}{4}$ in. wide at the top, but the

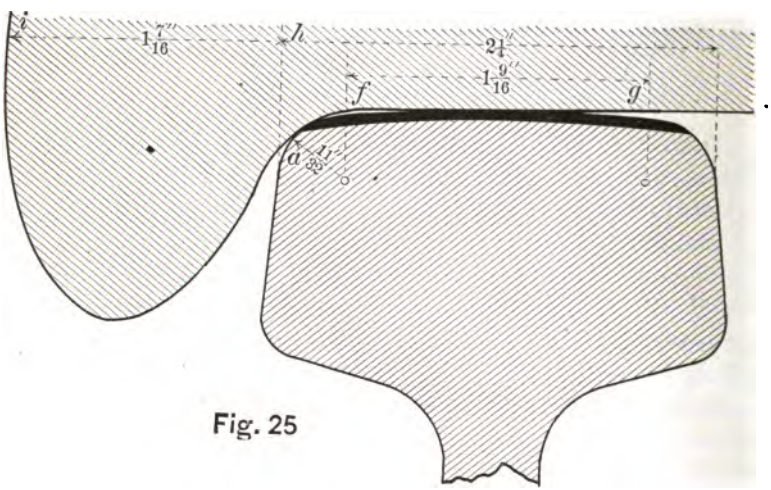


Fig. 25

width of the surface, $f\ g$ of Fig. 25, which supports the vertical load, is $1\frac{9}{16}$ in., whereas that of Fig. 23 is only 1 in. The black surfaces on top of the rails, Figs. 23 and 25, represent the sections of the metal which would be worn away when the rail was reduced $\frac{1}{16}$ in. in height. The heads of the rails in both figures are $2\frac{1}{4}$ in. wide, but a glance shows the difference in the amount of metal which must be worn away in reducing their height $\frac{1}{16}$ in. The top sixteenth in Fig. 25 has nearly fifty per cent. more area than that of Fig. 23. It is true that the difference of the successive sixteenths will not be so great as it is in the first, but it is apparent that the top half inch of Fig. 25 is very materially greater than that of Fig. 23. It is therefore not

surprising that those who design and are responsible for the wear of rails object to the adoption of a radius for their corners as long as $\frac{5}{8}$ of an inch. The wheel men, in fact, want to make this radius as long, and the rail men want it as short as possible. These differences of opinion and of practice must be reconciled before wheels and rails can be made to harmonize with each other. This can be done in three different ways: The rail may be made to fit the wheel, as in Fig. 23; or the wheel may be made to fit the rail, as in Fig. 24; or both may be altered to fit each other. Expressed differently, the throat of the flange may be made a curve of $\frac{11}{32}$-in. radius, like the rail in Fig. 24, or the corner of the rail may be part of a curve of $\frac{5}{8}$-in. radius, as in Fig. 23; or we might take a mean between the two and make the radii of both the corner of the rail and the throat of the flange, say $\frac{1}{2}$ in.

Before these alternatives are considered, attention will be called to the effect which the shape of the corner of the rail has on the gauge or rather end-play of the wheels. In Figs. 23 and 25, the flanges are the same shape and size, but the corners of the rails differ as already described. In both cases the flanges are represented close up to the rail. It will be noticed, though, that in Fig. 23, the distance *h i*, from the gauge line *h a* to the back of the flange, is $1\frac{1}{4}$ in., whereas, in Fig. 25, it is $1\frac{7}{16}$ in., or a difference of $\frac{3}{16}$. As the same difference would exist in the flange at the opposite end of the axle, wheels which are gauged exactly alike, or the same pair of wheels, *would have $\frac{3}{8}$ in. more end-play or clearance* on rails like the one shown in Fig. 23, than they would have on those like Fig. 25. *This is due entirely to the shape of the corners of the rails.*

In Figs. 24 and 25 the rails are alike, but the throat of the flange in Fig. 25 has $\frac{5}{8}$-in. radius, whereas the throat of the flange in Fig. 24 has $\frac{11}{32}$-in. radius. The flanges otherwise are alike. It will be seen that the distance *h i*, in Fig. 24, is $1\frac{5}{16}$ in., whereas, in Fig. 25, it is $1\frac{7}{16}$ in. Wheels like those in Fig. 24 would therefore have $\frac{1}{4}$ in. more end-play on rails like those represented, even though the flanges were placed exactly the same distance apart. *This is due to the shape of the throat of the flange.* It will, therefore, be seen that it is essential that there should be uniformity in the shapes of the corners of the rails and the throats of the flanges, if the gauge of the wheels and rails in relation to each other should be at all exact.

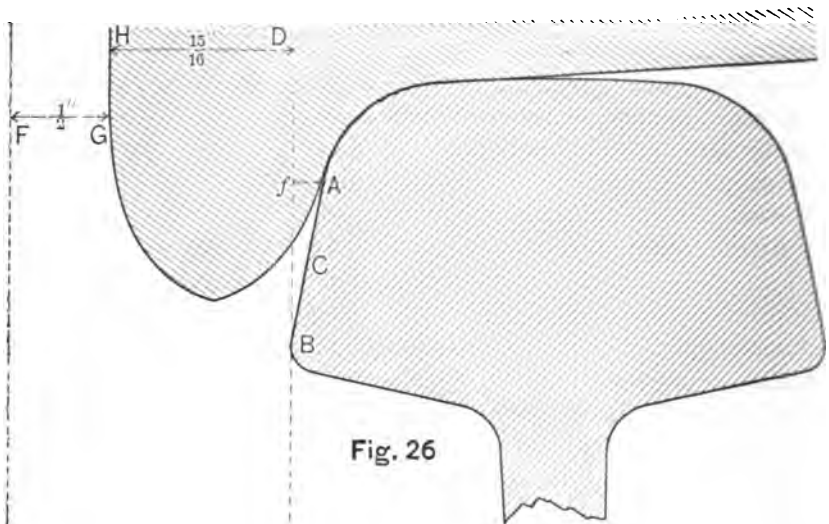


Fig. 26

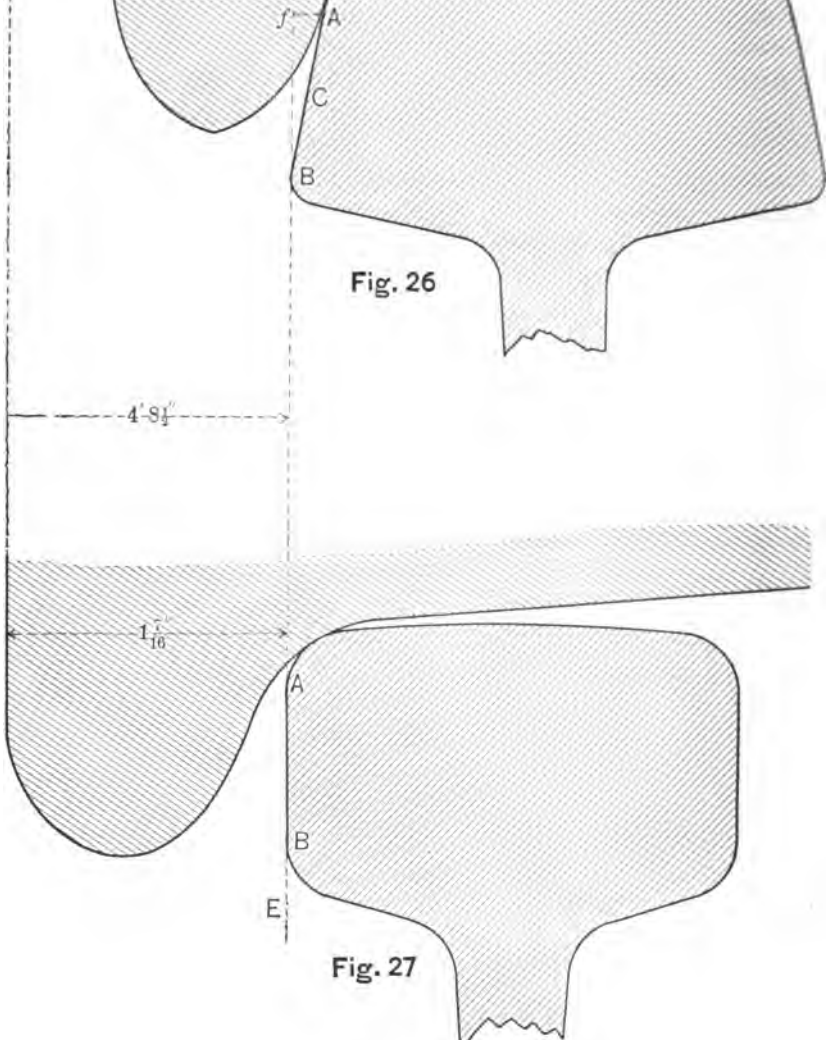


Fig. 27

The shape of the sides of the heads of the rails also has an important influence on the gauge. In Figs. 26 and 27, the vertical dotted line, *D E*, represents the gauge-line. In Fig. 26 the

rail head used in the Lehigh Valley Railroad is represented with its lower corner, *B*, conforming to this gauge-line, and the flange and tread shown in Fig. 5 is represented on the rail.

In Fig. 27, the rail-head used on the New York, New Haven and Hartford Railroad is represented with its side *A B* on the gauge-line *D E*, and with the tread and flange shown in Fig. 13 on top of the rail. Both flanges are shown against the side of the rail. From the extension upward of the line representing the back of the flange in Fig. 27, it will be seen that the distance *F G* from the back of the flange, in Fig. 26, is $\frac{1}{2}$ in. farther out than the one in Fig. 27. It will thus be seen that to have the same end-play flanges like the one shown in Fig. 27, when running on rails like that represented, must be gauged with their backs an inch closer together than flanges like that represented in Fig. 26, must be when running on rails of the Lehigh Valley pattern if they are gauged from *B*. Or, if the backs of flanges like Fig. 26 were gauged 4 ft. $5\frac{3}{8}$ in., the standard distance recommended by the Master Car-Builders' Association, they would have $1\frac{1}{4}$ in. end-play on the rails shown in the same figure, whereas, if flanges like Fig. 27 were gauged that distance, between their backs, they would have only $\frac{1}{4}$ end-play on rails like those of the New Haven road. It follows then that the form of the heads of rails, the method of gauging them, and the proportions and form of flanges are all important, and that standards should be adopted for each of them. It should be remembered too that the rails represented are the actual standards at present in use on prominent railroads, and that the flanges are the standard forms which two different wheel makers are, or were quite recently, using. If the gauge of the rail shown in Fig. 26 is measured from the point B, the point A will be about $\frac{3}{16}$ in. from the gauge-line, and therefore if the gauge of such rails is measured from *A*, it will really be $\frac{3}{8}$ in. wider than that of rails like the one shown in Fig. 27. This principle applies to all rails with sloping sides, and for this reason it is important that those in charge of the permanent way of railroads should agree to gauge the rails from the same point.

By referring to the Figs. in Plate VI. and to Figs. 16 to 18, it will be seen that the angles of the faces of the flanges, with a vertical line, vary all the way from $12\frac{1}{2}°$ to 32°. The question then arises what is the best angle

to use? The "rules governing the interchange of cars," adopted by this Association, provide that roads may refuse to receive cars if any of the flanges of the wheels have "flat verti-

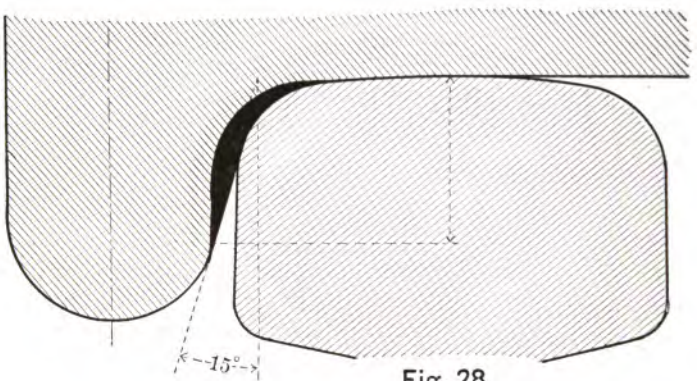


Fig. 28

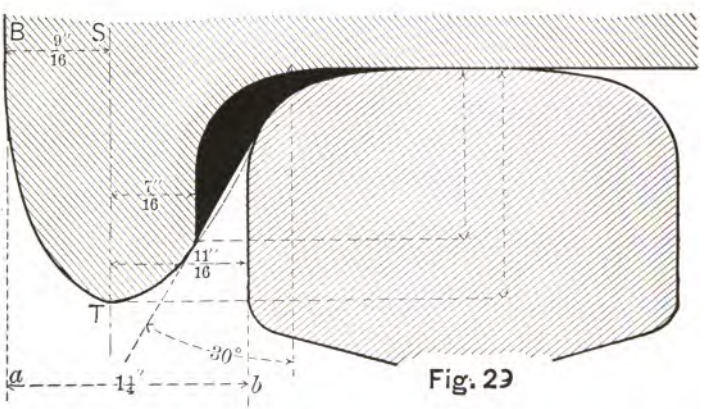


Fig. 29

cal surfaces extending over $\frac{7}{8}$ in. from tread of wheel." In Fig. 28, a flange is represented which has an angle of 15° with a vertical line. The black surface represents the metal in the throat of the flange, which, if worn away, will leave a "flat vertical surface extending over $\frac{7}{8}$ in. from tread of wheel." In Fig. 29, a flange having an angle of 30° is shown and a black surface shows the same result as in Fig. 28. A glance will show that more than twice as much metal must be worn out of the throat of a flange having an angle of 30° than from one having half that angle to produce a vertical surface $\frac{7}{8}$ in. deep. It will, there-

fore, wear twice as long. It is obvious that the metal represented by the black surface in a certain sense is *precious metal.* Without it cast-iron wheels are valueless, excepting as old metal, and when it is gone from steel tires they must be re-turned. If then, the endurance of a flange is increased with its angle, evidently it is desirable to make it as large as practicable. Of course, it is possible to make it so large as to incur the liability of the flange rolling up on, "or mounting the rail," but no complaint of this kind, so far as known to the writer, has ever been made of any of the flanges represented in Plate VI. and Figs. 16 to 18. Considering too, that the flange shown by Fig. 18 with an angle of 32° is the standard on all the German State railways, and is used with cars without trucks and very long wheel bases and that one of the most prominent manufacturers of cast-iron wheels in this country uses an angle of between 29 and 30°, indicates that the latter angle is entirely safe.

A large angle also has the advantage of increasing the amount of metal in that part of the chill-mold that comes in contact and must absorb the heat from the flange and throat. It is therefore believed that it is less difficult to get a good chill in the throat of a wheel if the flange has a large angle than it is with one having a small angle. For these reasons an angle of 30° with a vertical line is proposed for a standard.

The depth of the flanges shown in Plate VI. and Figs. 16 to 18 vary from 1 in. to $1\frac{3}{8}$ in., the majority being $1\frac{1}{8}$ in. The standard German flange is $1\frac{3}{32}$ deep. Very much the same practice in this particular prevails in British roads, although a great many flanges are used in British lines which are only 1 in. deep, and the standard for "wagon" tires on the London and Northwestern line is $\frac{15}{16}$ in. deep. There does not seem to be any reason for changing the prevailing practice here of $1\frac{1}{8}$ in., and the proposed form of flange is therefore made of that depth, measured from the tread next the flange, which makes the depth $1\frac{3}{16}$ in. if measured from the cylindrical part of the tread.

The toe *T* of the flange, Fig. 29, is made slightly pointed. The reason given for this is that that form will cut through snow or ice more readily than one made more obtuse. Another reason is that a pointed flange is less likely to strike a frog or switch point. In order to avoid doing this the point or the toe of the flange should be kept as near the middle of the flange-way as pos-

sible. When the flange is up against the rail, or in the position represented, the centre line $S\ T$ through the toe is $\frac{11}{16}$ in. from the gauge-line, whereas, when the back B of the flange is up against the guard-rail or frog the centre line $S\ T$ would be only $\frac{9}{16}$ in. from that side of the flange-way. It seems, therefore, as though the centre line $S\ T$ should be closer to the gauge-line than it is represented. But the flange is subject to wear, and when reduced to the form indicated by the black surface the worn face would be only $\frac{7}{16}$ in. from the centre line. While the flange is wearing, however, the tread is also usually reduced, so that the face is not ordinarily worn so close to the centre line when its vertical surface is $\frac{7}{8}$ in. deep, consequently the face would rarely be brought closer to the centre line than the back B. The end to be arrived at is to keep the point of the toe T as far from the main-rails and also from the guard-rails as possible. It must be remembered that with the standard distance of 4 ft. $5\frac{3}{8}$ in. between the backs of flanges, which has been adopted, and with $\frac{5}{16}$ clearance or end-play, between the flanges and rails on each side, that the distance $a\ b$, Fig. 29, from the back of the flange to the gauge line is only $1\frac{1}{4}$ in. and that the flange must be confined within those limits.

One of the difficulties which seemed to stand in the way of the adoption of the two forms of treads and flanges which were proposed by the Committee last year was that the one for cast-iron wheels had what was substantially a cylindrical tread, whereas the other, for steel-tired wheels, was coned. There appeared to be enough members opposed to coned wheels to defeat the form of tread proposed for steel tires, and sufficient number of believers in coning to defeat that proposed for cast-iron wheels.

The relative advantages of coned and cylindrical treads of wheels has been in dispute ever since railroads were first built. In the fourth and fifth annual reports of the Baltimore and Ohio Railroad for the years 1830 and 1831 the subject was discussed at great length, and articles on the subject are now frequently published in the technical papers. Without an elaborate and expensive series of experiments it is perhaps impossible to prove that either coned or cylindrical wheels are the most advantageous. It may be said, however, that whatever advantages may accrue from the use of coned wheels is soon lost, because the cone of the treads is

rapidly worn away, and the wheels then become either cylindrical in form or approximate thereto, or get what may be called reversed conicity. It is also true that nearly all who have investigated this question are agreed that cylindrical wheels are best on a straight track, and that it is on curves alone that coned wheels have any advantage.

Another objection to the use of coned wheels is that unless the rails are inclined a coned wheel-tread will bear only on the inner edge of the rail. This is illustrated by Figs. 19, 20, 27 and 30. The latter represents a section of the rail-head and wheel-tread and flange in use on the Philadelphia and Reading Railroad. The black surface represents the metal which must be worn away before the wheel will bear on the whole width of the rail. It will be seen that when the rails and wheels are new, the latter bear on only about half of the surface of the top of the rail. That the rails are actually worn as indicated by the black surface is shown by Fig. 32, which is a section of a worn rail which was laid in 1875 in a straight part of the Reading Railroad, and was taken up in 1882 after a tonnage of about 105,000,000 tons had passed over

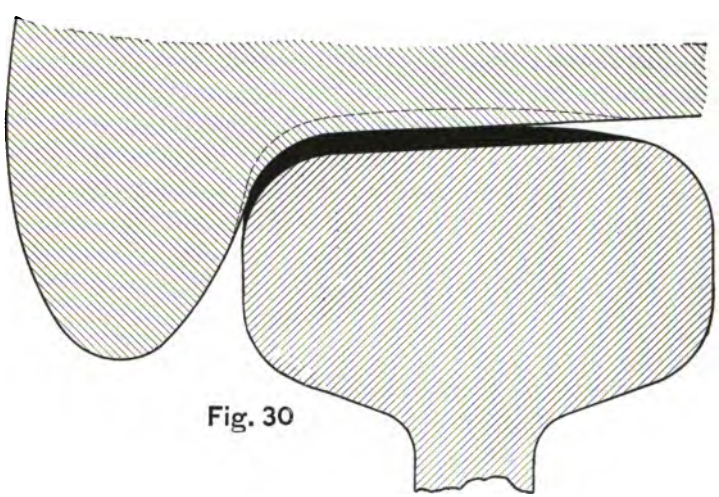


Fig. 30

it. By referring to Fig. 30, it will be plain that new rails, of the form represented, will wear the wheels to a form indicated by the dotted line. If then we take a wheel worn to this shape and put it on a rail worn as shown in Fig. 32, we will have the condition of things represented in Fig. 31.

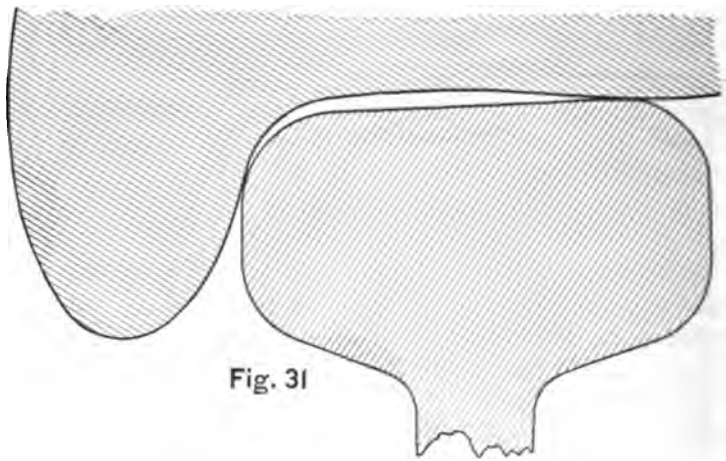


Fig. 31

Fig. 33 is a section of the head of a rail laid on a straight part of the Reading track in 1867, and at the time this section was taken a tonnage of 176,000,000 tons had passed over it. The rail had been reversed "to equalize the wear." If a rail has been worn by coned wheels, into the form shown by Fig. 32, and is then reversed, the wheel and rail would then bear the relation to each other shown in Fig. 34. It will be seen that the surfaces in contact are extremely small. Under these conditions the wear of both wheel and rail must be very rapid. On British roads, where wheels are ordinarily coned, more than they are here, the rails rest in cast iron chairs, and these are made of such a shape that the rail is inclined, so that their top surfaces will have the same inclination as the surface of the coned wheels. Attempts have been made in this country to "spot" the cross-ties, or give the surface on which the rails rest an inclination, so that the top of the rails and the treads of the wheels will coincide with each other, but owing to the cost, inconvenience and other objections to this practice, it has been generally abandoned.

But even if the rail is inclined so that the top of the rail will conform to the tread of the wheel as shown in Fig. 39, there is then the objection that the diameter of the wheel at A, where it comes in contact with the outside edge of the rail, is, with the amount of conicity represented, about $\frac{7}{16}$ in. less than at C, where it is in contact with the inner edge; so that when running on a straight line or on the outside rail of a curve, some portion of the tread in contact with the rail must slip. The difference in

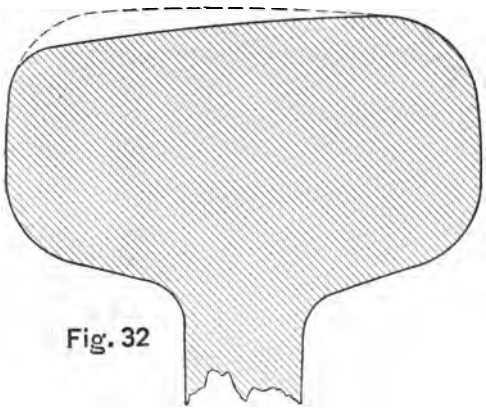


Fig. 32

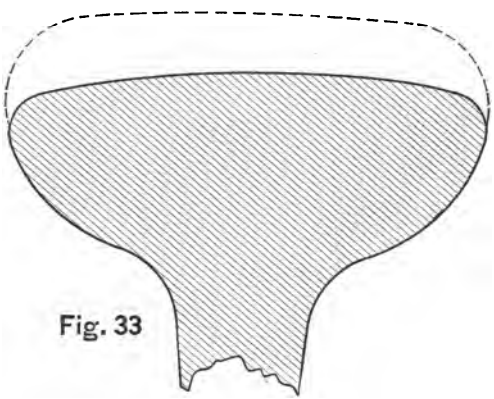


Fig. 33

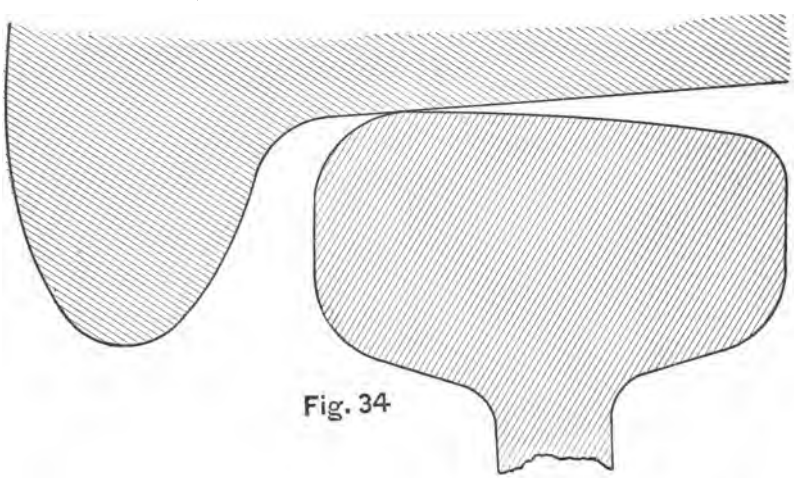


Fig. 34

circumferences at A and C is $1\frac{3}{8}$ in. so that during each revolution there must be that amount of slip at either A or C. It is true that the portion of the wheel at B in contact with the centre of the rail might roll without slipping, but in that case there would be a backward slip at C of $\frac{11}{16}$ in each revolution and an equal amount forward at A. It is also true that the cone of the wheel which is illustrated is excessive, but the evils explained are of the same character with any coned wheel but in proportion to the amount of conicity of the wheels.

The argument which is used in favor of coned wheels is that in going around a curve the wheels on the outer rails roll outwards so that their flanges are in contact with the rails, and consequently their treads bear on the rails at a point near the flanges, where the diameter is largest, and that the wheels on the opposite side bear on the rails at a point some distance from the flange where the diameter is smaller. During one revolution of the axle, therefore, the outside wheel is supposed to advance further than the inside one, which has a tendency to cause the two to roll in a curved path. In reply to this argument it is said that if each of the axles could assume positions which would be radial to a curve it would be true that they would roll in a curved path, but that when they are attached to a frame which holds them both in such positions that their centre lines are always parallel, that the argument loses much, if not all, of its force, because, under these circumstances, the wheels are not free to roll in a curved path. It is said even that a model consisting of a pair of axles, held parallel to each other in a frame similar to a truck-frame, with four wheels, of which the two on one side are larger in diameter than those on the opposite side, will not move in a curved path if allowed to roll freely down an incline. In order to test this, the writer had a model made, which is represented by Figs. 35–37. The wheels on one side were $1\frac{7}{16}$ in., and those on the other, $1\frac{5}{16}$ in. in diameter. The axles were held in position and turned on pointed steel set screws, AA, and a series of holes, bbb, were drilled in the frames, CC, and tapped to receive the screws, so that the two axles could be spread a distance of 5 in. apart from centre to centre or brought within $1\frac{1}{2}$ in. of each other. This model was weighted with a cast-iron weight, W, and allowed to roll freely on a sheet of drawing-paper, which was stretched perfectly smooth

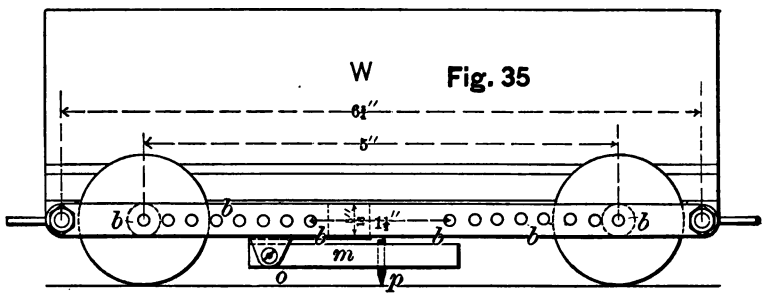
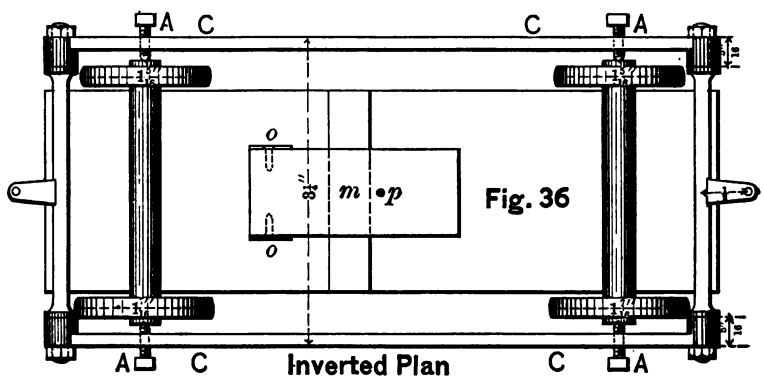


Fig. 35



Inverted Plan

Fig. 36

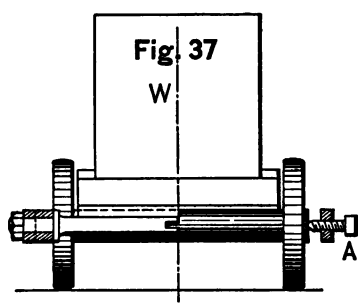


Fig. 37

on a drawing-board. The wheels were rounded on their treads so that they could move freely laterally. A pencil, *p*, was attached to the under side and at the centre of the model, so as to bear very lightly on the paper. The axles were then placed at different distances and the board was given just sufficient inclination to cause the model to roll down the incline. The pencil then drew a line which marked the path in which the model rolled. A single pair of the wheels alone rolled in a circle of 26¾-in. radius. The results of the experiments with the model were as follows:

A single pair of wheels alone rolled in a curve of 26¾-in. radius.
With two axles, 1½ in. apart, the model rolled in a curve of 33½-in
" 2 " " " 45¾
" 2½ " " " 66½
" 3 " " " 87¼
" 3½ " " " 125½
" 4 " " " 168⅞
" 4½ " " " 239½
" 5 " " " 321⅝

The model, compared with a full-sized truck, was mad
scale of ½ in.=1 foot, or $\frac{1}{24}$ of full size. The wheels on ea
therefore, represented full-sized wheels of 34½ and 31½ i
difference of 3 in. in diameter. If we convert all the
sions of the model and the results of the experiments i
full size which they represented, they would indicate that
pair of wheels in the same axle, with a difference of 3 in.
diameters, will roll in a curve of 53½ ft. radius. Two
such wheels, if the axles are held parallel, as in the model
roll in the curves specified in the following table:

Axles 3 ft. apart will roll in a curve of 67-ft. radius..
" 4 " " " 91½ "
" 5 " " " 133 "
" 6 " " " 174½ "
" 7 " " " 251 "
" 8 " " " 337¾ "
" 9 " " " 479 "
" 10 " " " 643¼ "

From Plate VI., Figs. 1 to 15 it will be seen that the co
the wheels represented varies from $\frac{3}{32}$ of an inch to $\frac{5}{64}$ in
one side, so that there is a difference of $\frac{3}{16}$ in. to $\frac{5}{16}$ in. in d
in 3 in. of length of the tread of the wheels, or an ave
about $\frac{5}{16}$ in. If it is remembered that wheels ordinaril
only about $\frac{3}{4}$ of an inch end-play on the wheels, it will
that the actual difference in the diameters in which wheels
$\frac{5}{16}$ in. cone in 3 in., is in the following proportions:

$$3 : \tfrac{3}{4} :: \tfrac{5}{16} : \tfrac{5}{64}$$

That is, there is a difference of only $\frac{5}{64}$ of an inch in
meters in which ordinary coned wheels roll in passing
curves. If, then, with a difference in diameter of 3 in., tw
of wheels will roll in the curves given in the last table, th
simple proportion, we can calculate the curves in which
having $\frac{5}{64}$ of an inch would roll, which would be as follow

Axles	3	ft.	apart	will	roll in a curve of	2,572.8 ft. radius.
"	4	"	"	"	3,513.6	"
"	5	"	"	"	5,107.2	"
"	6	"	"	"	6,700.8	"
"	7	"	"	"	9,638.4	"
"	8	"	"	"	12,969.6	"
"	9	"	"	"	18,393.6	"
"	10	"	"	"	24,700.8	"

These figures show how very little influence the ordinary coning which is given to car wheels has in causing them to roll around curves. Such wheels would cause a freight-car truck spread 5 feet apart to roll in a curve of 5,107.2 feet radius and a six-wheeled truck, spread 10 feet would roll in a curve of 24,700.8 feet radius, or about $4\frac{3}{4}$ miles. In curves of shorter radius than this the wheels must be moved laterally by the pressure of the flanges against the rails. The theory that a cone will roll in a curve as freely as a cylinder will roll in a straight line is very attractive, so much so that those who have used it in favor of coning car-wheels, have lost sight of the fact that two cones with their axles held parallel with each other are not free to act as one will when entirely free. The fact, too, that the tendency which a cone has of rolling in a circle is counteracted by spreading two parallel axles further apart has also been lost sight of, or perhaps has not been known. In order to show how great the influence of increasing the distance is in overcoming the influence of the conicity of the wheels, the results of the experiments with the model, which have been described have been plotted in Fig. 38. *o* 5 is a horizontal base line on which the distance *o* $\frac{1}{2}$, *o* 2, *o* $2\frac{1}{2}$, etc., between the centres of the axles, has been laid down. On the perpendicular from *o*, the radius *o a* of the curve in which the single pair of wheels alone rolled, was laid down on a scale of $\frac{1}{100}$. From $1\frac{1}{2}$ the distance $1\frac{1}{2}$ *b* equal to one one-hundredth of the radius of the curve in which the model rolled when the axles were $1\frac{1}{2}$ inches apart. From the other points in the horizontal base line the radii of the curves in which the model rolled with axles at different distances apart were laid down in the same way. Through the extremities *a*, *b*, *c*—*i* of these perpendiculars, a curve was drawn which represents graphically the rate at which the radii of the curves in which the model rolls, with the axles at different distances

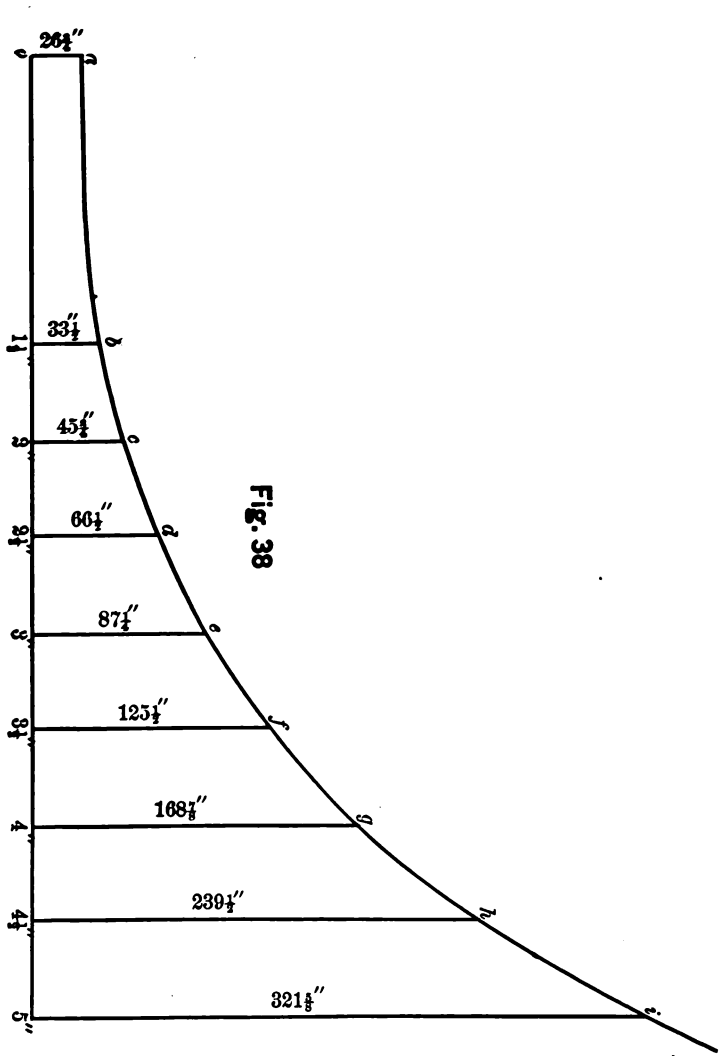


Fig. 38

apart, approximate to infinity. No doubt the nature of this curve is capable of mathematical expression and analysis, but this is not a suitable occasion for such an investigation even if the author of this paper was competent to make it. Without being analyzed however, the diagram indicates all that it is now necessary to show, which is, that the cone of wheels is of very little importance when the wheels are spread a considerable dis tance apart.

Not only is this the case, but as has been stated before, in service the cone of wheels is quickly worn away, and after a given amount of wear a reversed conicity results so that the diameter of wheel on the inside of the curve when it bears on the rail has a larger diameter than the one on the outside. Figs. 40 and 41 represent sections of two wheels in the same axle which were worn to this shape on the New York Central Railroad. They are shown in the positions they would occupy on outer and the inner rails of

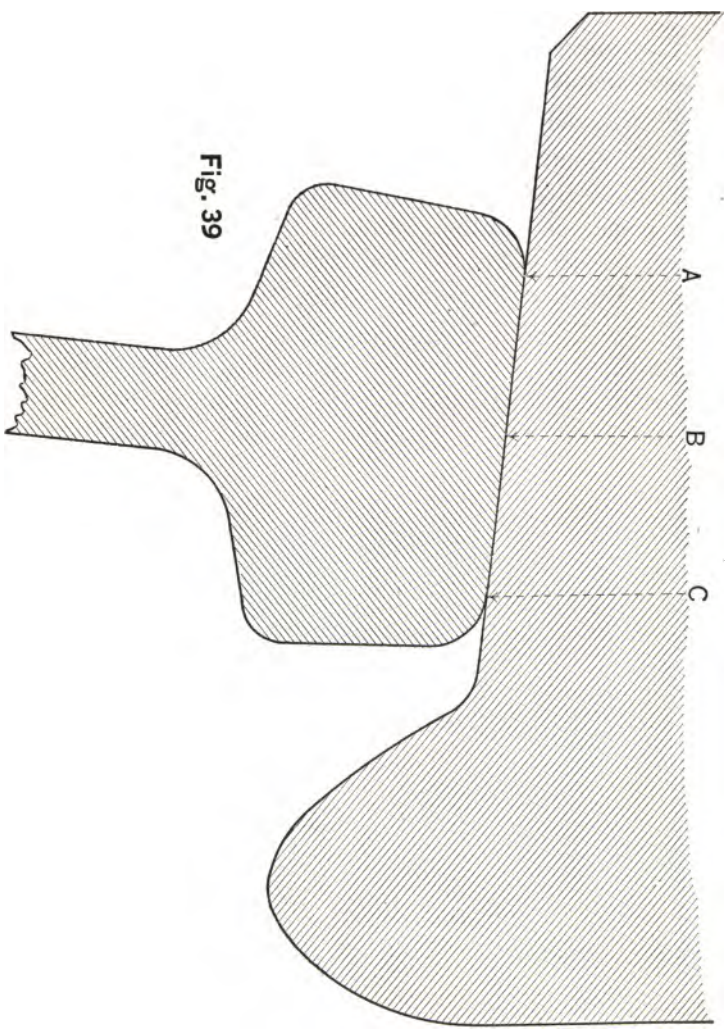


Fig. 39

a curve of which the gauge has been widened a half inc
sections of the wheels were drawn with templates cut so
the treads of the wheels accurately. It will be seen from
that the diameter of the wheel at *E*, where it bears on th
rail, is considerably larger than that of the opposite whe
41 at *F*, where *it* bears on the outside rail, so that th
which should have the largest diameter has the smallest,
versa.

From what has been said then it may be inferred:

1. That the advantage which results from coning w
very slight and of little practical importance.

2. That the advantage of the cone which is given to w
very temporary, as the conicity is soon worn away.

3. That the tread of a coned wheel has very little
surface on the rail, and therefore it wears the rails and is
them very rapidly unless the latter are inclined so that th
conform to the shape or position of the tread.

4. If the rails are inclined then some portion of the t
the wheels in contact with them must slip on a straight l
on the outside rails of curves which causes increased w
resistance.

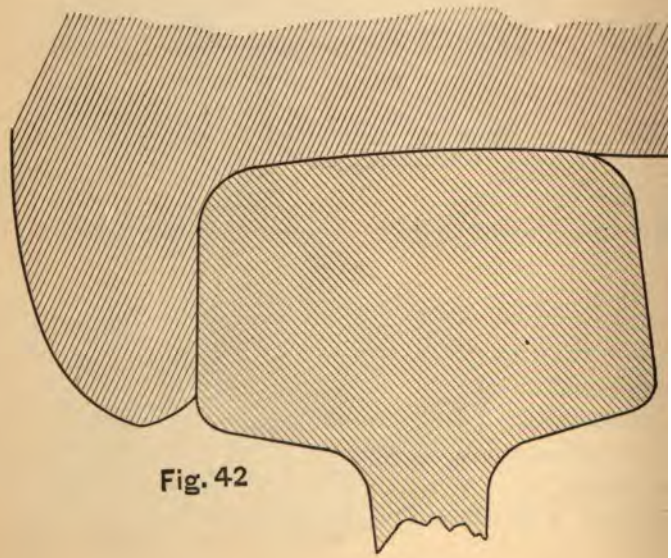


Fig. 42

always convinced by arguments, and it is often right that they should not be. Doubtless many of them will hereafter, as they have heretofore, continue to believe that coned wheels have some practical advantages which cylindrical wheels have not. This being the case, agreement concerning a standard, which is the object sought by this Association with reference to this and other subjects, would be much more likely to be brought about, if a form of tread and flange was devised which would combine the advantages of both a cylindrical and a coned tread.

It has already been pointed out that the only way to reconcile the conflicting views concerning the length of radius of the corner of the rail and the throat of the flange is by compromise. Some rail-men want a radius of $\frac{5}{16}$ in., while wheel-men want $\frac{5}{8}$ in. Adopting the compromise which has been suggested for this dimension, we will take the head of one of Sandberg's rail sec-

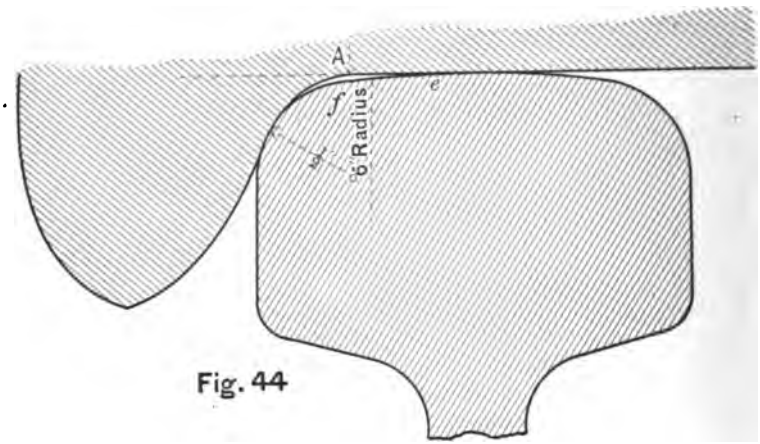


Fig. 44

tions, Fig. 44, the corner of which is described with a radius of $\frac{1}{2}$ in., which is nearly a mean between $\frac{5}{16}$ in. and $\frac{5}{8}$ in. The top of this and all other Sandberg sections is described with a radius of 6 in. On this rail, a cylindrical tread of a wheel has been drawn, which, it will be seen, does not conform to the shape of the top of the rail when the flange is against the rail, as represented, and that there is a little space between them at *f*. If the tread, instead of being a straight line, was made to conform to the curved top of the rail, from its centre *e*, to the throat of the flange at *f*, as shown in Fig. 45, not only would the tread and flange fit the rail accurately when they are in the position shown, but the diameter of the wheel at *A*, where it bears on the rail,

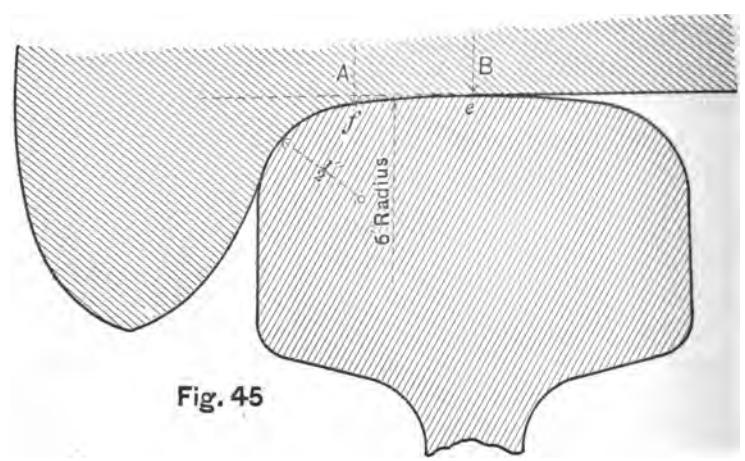


Fig. 45

would be larger than it is at *B*, where the tread of the wheel is cylindrical. When the flange of one wheel is in the position represented, that in the other end of the axle is some distance from the rail, and therefore the cylindrical part of its tread bears on the rail. It is therefore plain that if the treads are formed as described they will act substantially like coned wheels on curves. On a straight line

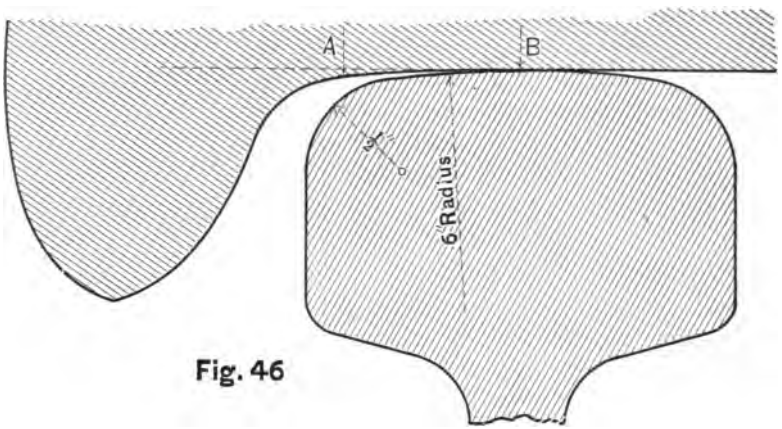


Fig. 46

both wheels will be in the position represented in Fig. 46. The cylindrical part of their treads will then bear on the rails. The wheels, therefore, would be, practically, cylindrical in a straight line, and act like coned wheels on a curve, and thus have the advantages of both forms—if there are any.

To get at the best form of wheel tread for resisting wear templates were made from a number of worn wheels to determine the nature and the form which they assume. Figs. 47 and 48 represent two actual and typical specimens of worn wheels which were on the same axle, the black surface representing the metal which was worn away. The flange in Fig. 47, it will be seen, is worn considerably, whereas that in Fig. 48 is worn very little. The treads were coned about $\frac{1}{8}$ in. in their diameters in a length of 3 in., and were worn so much that the diameters of Fig. 47 at *A* was about $\frac{3}{8}$ larger than that at *B*, and in Fig. 48 this difference was about $\frac{1}{4}$ in. If we assume, as the manufacturers did, that the original, or what will be called the normal, form of the treads of these wheels was the best shape, then evidently as the wheels were worn their treads departed further and further from

. from the face. Figs. 53 and 54 represent treads beveled for
stance of 2 in. from the face, with a difference of $\frac{1}{2}$ in. in
eter. The same amount of wear that is shown in Figs. 51
52 was then laid off on these treads, with the result shown.

practice of different engineers and road-masters really is. With the advice of your President, the circular already referred to was prepared and was sent to the managers, engineers and car-builders of all the roads in the country. The replies which have

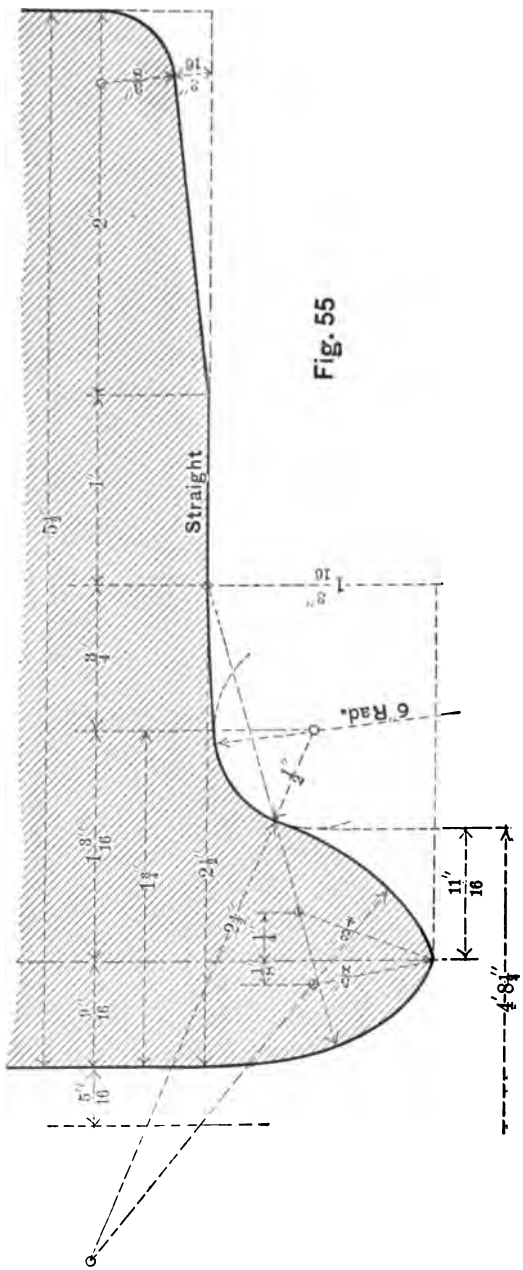


Fig. 55

been received have been tabulated, and are given in the table, Plate V. From the table it will be seen how much variation there is in the laying of track on different railroads.

A circular was also sent to the car-builders, who are members of this Association, asking them how much the distance between the backs of flanges of car-wheels varies in practice from the standard distance—4 feet 5⅜ inches—which has been adopted by the Master Car-Builders' Association, and requesting them to give the greatest and least distance between the backs of flanges of wheels which they have measured under foreign cars. Candor compels me to admit that the latter circular received much less attention from car-builders than the former one did from the civil engineers and road-masters. Fourteen replies were all that were received from the car-builders. The following table will give the substance of the replies :

DISTANCE BETWEEN FLANGES OF CAR WHEELS.

Name.	Greatest Distance.		Least Distance.		Variation from M. C. B. Standard.		Total Difference.
					+	−	
	Ft.	In.	Ft.	In.	In.	In.	In.
Robert Miller	4	5¾	4	5⅛	⅜	¼	⅝
Charles Blackwell	4	5⅞	4	4⅞	½	½	1
L. Garey	4	5½	4	4¾	⅛	⅝	¾
Wm. Forsyth	4	5⅞	4	5⅛	½	¼	¾
Jno. S. Lentz	4	6	4	5¼	⅝	⅛	¾
P. Reilly	4	5⅝	4	5⅜	¼	0	¼
Peter Smith	4	5⅞	4	5	½	⅜	⅞
John Kirby	4	5⅞	4	5	½	⅜	⅞
W. F. Turreff	4	5½	4	5	⅛	⅜	½
R. C. Blackall	4	5⅞	4	5¼	½	⅛	⅝
J. W. Fleming	4	5¾	4	5⅛	⅜	¼	⅝
.....	4	5⅜	4	5	0	⅜	⅜
R. H. Soule	4	5¾	4	4¾	⅜	⅝	1

We have here a maximum distance of 4 ft. 6 in., and a a minimum of 4 ft. 4¾ in. If now we refer to the table of the dimensions of permanent way it will be seen that on many roads it is the practice to make the flange-way between the guard-rails and main-rails and between the wing-rails and frog-points 1¾ in., so that the distance *over* the guard-rails and wing-rails is 4 ft. 5 in., or ¼ in. more than the minimum distance between the flanges of the wheels. There are cases too of the flange-way being only 1⅝ in. The distance over the guard-rails and wing-rails would then be ½ in.

more than that between the flanges of the wheels. That it should be difficult with wheels gauged in that way to keep guard-rails in position, and that axles should be bent and wheels broken is not surprising.

There has not been time to analyze the table of track dimensions very carefully. It must be said, however, that the distance over the guard-rails in all the cases which have been examined in the table is less than the standard distance between flanges of wheels adopted by this Association. With $1\frac{5}{8}$-in. flange-way, however, the distance over the guard-rails will be 4 ft. $5\frac{1}{4}$ in., and with $1\frac{3}{4}$-in. flange-way it will be 4 ft. 5 in. It is a question for the consideration of this Association whether $\frac{1}{8}$ or even $\frac{3}{8}$ in. is enough end-play or clearance between the wheels and guard-rails.

The variation in the distance between the flanges of wheels also suggests that there should be some positive limit to this variation. With cast-iron wheels and rough flanges exactness of gauge is impossible. If the distance between flanges is fixed at 4 ft. $5\frac{3}{8}$ in., it must be left to the judgment of the workmen how much variation therefrom is admissible. Experience shows that if the discretion of workmen in such matters is relied on, that great variations from the standard are almost certain to result. The Pennsylvania Railroad officers have wisely fixed the limit, or least distance between flanges of wheels which will be received on its line at 4 ft. $5\frac{1}{4}$ in. It seems as though the standard gauge roads might properly adopt a maximum limit. It is therefore thought that it would be a wise measure if this Association should adopt a maximum and minimum standard distance between flanges of wheels. If, instead of fixing this standard at 4 ft. $5\frac{3}{8}$ in., it was stipulated that it shall not be more than 4 ft. $5\frac{1}{2}$ in., nor less than 4 ft. $5\frac{1}{4}$ in., the differences and errors would be confined within those limits. As the standard is now expressed the distance is made full or scant, which may mean $\frac{3}{8}\frac{3}{2}$, $\frac{3}{8}$, or $\frac{3}{4}$ in. more or less than it ought to be.

The suggestions of this paper may then be summed up as follows:

1st. That the standard form proposed in this paper for the treads and flanges of wheels should be adopted experimentally by this Association, that is, that the members should agree to put a sufficient number of wheels with treads and flanges of that shape in service, so as to be able to report thereon at the next

annual meeting, with a view to the final adoption of the form as a standard.

2d. That the distance between the tacks of flanges should be limited to maximum and minimum dimensions as proposed.

3d. That the officers of the permanent way departments should agree on some standard form for the corners and tops of rails, preferably $\frac{1}{2}$-in. radius for the corners and 6-in. radius for the tops.

4th. That they should agree on some point on the rail from which the gauge should be measured.

5th. That they should establish a standard gauge for the distance over all guard and wing rails.

These suggestions are submitted with a view of putting them into some definite form for discussion, and with the assurance that all that is needed to remedy the evils pointed out, is that they should receive due consideration from those for whom this paper has been written.

MATTHIAS N. FORNEY.

MR. MILLER—I move that this paper be received and printed as part of the records of this convention.

Agreed to.

THE PRESIDENT—This subject is now open for discussion. I should be very much pleased to hear from the permanent way men who are present this morning on this subject. There is a gentleman present who has had very much experience on this subject. I will call upon Mr. Otis, of the New York Central & Hudson River Railroad, to give us some suggestions as to how we can accomplish what is desired.

MR. OTIS said he was not prepared to make any remarks and asked to be excused.

The President called on Mr. Anderson to address the Convention.

MR. ANDERSON—Not being a car-builder I did not expect to attend this meeting, and had no idea of the matters which would be discussed. I am not prepared with any figures that would be of any interest, so I will ask to be excused.

THE PRESIDENT—I will say to the permanent way men that the Master Car-Builders do not desire to assume any of their duties. They wish to help all they can, and they require all the help they can get in order to have things right, but there is no better way of arriving at correct conclusions than through discussion. In discussion new ideas are presented and in all cases parties who listen are necessarily benefited. I hope this subject will receive due attention.

MR. BLACKALL—I would like to hear from the representatives of the Track Department, if it is their habit to set the gauge of track on curves the same as they do on tangents. I understand there is a difference of opinion amongst them on this question.

MR. CAFFREY—I would beg leave to say, as the representative of the Track Department of the line with which I am connected, that it is the practice so far as I am concerned to widen the gauge on curves not in any case more than a half inch for curves of a radius of 500 feet. When curves are less than that it may be desirable to widen them a very little more but not in any case more than three-quarters of an inch. This is desirable only on very sharp curves where the speed is not very great.

MR. FORNEY—If Mr. Blackall will refer to the table appended to the paper which has just been read, and look at the column which is marked 16 at the top, he will find that the practice of many different railroads, with reference to widening the gauge on curves, is given in that column.

MR. GOODWIN—Mr. Caffrey, who has just spoken, is our road-master, and he has stated that point in regard to our system and practice. There are also other things which Mr. Caffrey might state, which would be of interest.

THE PRESIDENT—I know Mr. Goodwin has paid considerable attention to sharp flanges and their causes, and no doubt he can say something on this subject that would be of value to us.

MR. GOODWIN—Our committee on the subject of sharp flanges did give a good deal of attention to this matter, and we came unanimously to the conclusion and reported at the last meeting one year ago, that the main cause of sharp flanges was the fact that wheels and rails did not fit each other. I believe all the committee agreed upon a point of fact, namely, as to what was the general or perhaps almost universal custom of wheelmakers in regard to the radius of this curve between the flange and the tread—that it is almost universally $\frac{5}{8}$ in. That seems to have been the curve agreed upon and adopted by all parties making wheels, both railroad companies and wheelmakers. Now it seems to me that having come to that universal practice as to the radius of the curve, we have got one step towards solving the problem which is before us, and the remaining step is to bring about the making of rails of the same radius. Now, if the rail is made of the same radius, $\frac{5}{8}$ in. on the corner or top of the edge, it will fit the flange and will remove that cause which we consider to be the very great cause of sharp flanges; and this "precious metal" that Mr. Forney speaks of, will not be worn off. I like that idea of calling it "precious metal." We have already received this report, and ordered it to be spread on the minutes as part of the proceedings. It is a very able report, and perhaps I may say, exhaustive. It shows a great deal of attention and research on the part of the Secretary. But I differ from him on one point. I think that his plan of wheel tread is a most admirable one. I think he has an excellent idea in regard to that, with the one exception of the radius of the curve; and if he could modify that plan, Fig. 55, and leave the rest just as it is, I think he will have a tread of wheel there that will be just about as near perfect as we can get it. In regard to the shape of rail, and a radius of $\frac{1}{2}$ in., I would say that we have used on the Lehigh Valley Railroad rails with that curve for the past twelve years, or perhaps, longer, and they are in use also on some other roads; and I believe there is a general tendency now to get rails into that shape, and I think it would be a movement backward that would throw the whole thing into confusion to alter that. I would recommend then, in regard to the suggestion made here, that before adopting that plan, that it should be changed; that that standard form should be changed so as to make the radius between the flange and tread of the

wheel $\frac{5}{8}$ instead of $\frac{1}{2}$ in. Then I would propose in article 8d, to say, preferably, $\frac{5}{8}$ in. radius instead of $\frac{1}{2}$. I do not see anything else in these suggestions that could be improved on. I make the motion now that before adopting this suggestion, the standard form as presented here be changed to show a radius of $\frac{5}{8}$ in. instead of $\frac{1}{2}$, and also that that $\frac{5}{8}$ be substituted in article 8d for $\frac{1}{2}$ in.

Seconded.

THE SECRETARY—Before the discussion goes any further, a little business requires attention. The Nominating Committee have made a report on the nominations for next year, and I will read them now, as they must lie over twenty-four hours before an election can take place. I will read the report:

REPORT OF COMMITTEE TO NOMINATE OFFICERS FOR THE ENSUING YEAR.

The Committee appointed to make nominations for officers for the ensuing year, respectfully report the following names:

For President, LEANDER GAREY.
" 1st Vice-President, WILLIAM MCWOOD.
" 2d " " J. W. CLOUD.
" 3d " " B. K. VERBRYCK.
" Treasurer, JOHN KIRBY.
" Executive Members, F. D. ADAMS.
" " " JOSEPH TOWNSEND.
" " " G. W. RHODES.

Respectfully submitted,

J. N. LAUDER,
SANFORD KEELER,
W. F. TURREFF,
JOSEPH WOOD,
J. TOWNSEND.
} *Committee.*

THE SECRETARY—I will make a motion that the wheelmakers and railroad superintendents, who are not members of the association, be invited to take part in this discussion.

The President thereupon invited any wheel manufacturers or railroad superintendents present or others interested in the subject, who might not be members of the Association, to take part in the discussion.

MR. DAVENPORT—I listened with a great deal of interest to this paper, and am very glad to know it is going upon the record permanently, because such a report is worthy of that consideration and more.

In the matter of wheels there are two standpoints from which you may look at the question, that of the engineer considering the track, and that of the car-builder who considers the wheels, or, if you please, the wheel-maker considering how he can make the best cast-iron wheel, give the greatest average mileage and be the safest wheel to run, and which will be liable to the smallest number

of mishaps that might befall a wheel in service. The form of wheel, as Mr. Goodwin has suggested, has some excellent points about it, and in only two respects would I suggest any change. The height of the flange of a wheel has much to do with what you are able to make the wheel perform. It is a very difficult matter if you have the height of flange more than 1 inch to get the requisite depth of chill in the throat of the flange where, as our Secretary properly says, the "precious metal" lies. How to get that is the problem. If the throat of the flange be ½ in., I think you will find it simply impossible; I think every wheel-maker present and every wheel-maker in the country will inform you that 1⅛ in. height of flange with ½ in. radius at the throat will make a light chilled wheel in the throat of the flange—too light for service. This is a well-known fact among wheel-makers. The height of flange has been going down step by step, as the practice has shown the bad policy of high flanges. The Pennsylvania Road, I am informed, adopted one inch as the height of their standard flange. They are wise in this, beyond doubt.

I had an interesting conversation with our lamented friend, Howard Fry, on this subject. He informed me that he had been experimenting on the height of flange, and was persuaded that ¾ in. would be a great improvement over 1 in.

There is one other point. The suggested form of the flange gives a thin flange at the upper edge. That will involve a chilled-through flange, which I do not think any car-builder wants. If the wheel is a high chilled wheel, the flange will be chilled through probably one-third of its height, weakening the flange to that degree. Now, I have had drawn by practical men a diagram (see Fig. 56), which copies almost exactly the flange and tread proposed, except in these two particulars of height of the flange and the radius of the throat of the flange. In these two respects it differs. The height of the flange proposed is 1 in. and the radius ½ in. This, you will observe, will give you a flange with great powers of resistance. The flange, you know, constantly grows deeper as the wheel wears. You have a flange with great powers of resistance; you have a throat with a great deal of wear in it; you have a very strong flange; you have a flange which comes within the requirements which have been made and adopted. And, therefore, Mr. President, I move as an amendment that we advise this as the form of flange and tread of what may become the standard car wheel.

MR. GOODWIN—It would be interesting, I think, if Mr. Davenport would rehearse to the meeting the dimensions and shape of this plan. We would like to know what is the radius of the curve, what the distance between the back of the flange and the vertical line of the curve and fillet, etc.

MR. DAVENPORT—The distance from out to out is the same as proposed and adopted, 5½, the back of the flange is described with a radius of $1\frac{1}{16}$ from a point directly under the crest of the flange swinging that radius from the further point to almost on the immediate crest, the slope is the same as that which was submitted to letter ballot last year. It will be found a great saving in the chipping out of wheels on bad frogs. The distance from the root of the flange to the point where the bevel begins is 2 inches, and has a cone in that distance of $\frac{1}{16}$ inch. It has been the practice to cone wheels in this way, but as all matters of this kind must be matters of compromise, those holding to the cone idea are not going to give it up entirely, and those holding to the straight tread idea, will continue to hold to it; and, there-

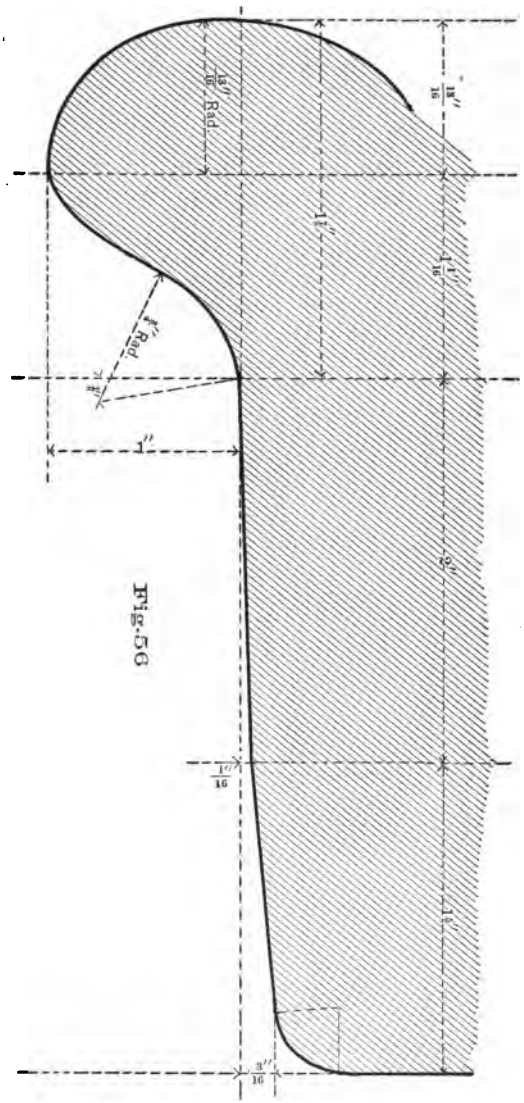

$\frac{15}{16}$''
$\frac{15}{16}$'' Rad
1''
$\frac{1}{16}$''
$\frac{1}{4}$'' Rad
$\frac{1}{4}$''
1''
2''
$\frac{1}{16}$''
1''
$\frac{3}{16}$''

Fig. 56

fore, in order to effect an agreement there must be a compromise, and the yielding of $\frac{1}{16}$ inch there, which corresponds almost exactly with the report of our Secretary, except that instead of forming that tread of the wheel in a hollow we run it straight across, having a little more metal for wear. True, it may be said that the cone wears off. Certainly. The wheel wears out, but while you are wearing that cone out you are making mileage and making money for our companies in making that mileage.

MR. GOODWIN—Will Mr. Davenport please say what is the radius of that curve between the tread and the flange?

MR. DAVENPORT—This is $\frac{3}{4}$-inch.

MR. GOODWIN—What is the difference from the back of the flange up to the vertical line?

MR. DAVENPORT—$1\frac{7}{8}$-inch.

MR. GOODWIN—As I proposed a $\frac{5}{8}$-inch radius in place of $\frac{1}{2}$-inch suggested by the Secretary, I would still propose a $\frac{5}{8}$-inch radius in place of the $\frac{3}{4}$-inch proposed by Mr. Davenport, but for the opposite reason perhaps. Now, we know this, that rails have heretofore been made with a shorter radius, and the tendency is now to get them at $\frac{5}{8}$-inch to fit the wheels; and the statement I made has not been controverted here, that it is the practice of almost all wheelmakers to make that curve with a radius of $\frac{5}{8}$-inch. Now, if we are trying to get the rails out of that and make a good fit between the rail and the wheel, this will throw the matter into confusion again as badly as if we attempted to come back to $\frac{1}{2}$-inch. The labors that we have expended on this matter will go for naught, and we will be worse off than we now are. I do think it is a very important matter to keep that curve at $\frac{5}{8}$-inch. I have nothing to say against Mr. Davenport's plan of tread. How can we ask anybody to make a rail with a flatter curve on top? If you keep flattening that, you will get the whole top of your rail curved, and the consequence is you narrow your point of contact with the rail, which is objectionable. I think if this motion of Mr. Davenport prevails, and that plan takes the place of the one proposed by our worthy Secretary, we shall be worse off than if we adopted his plan.

MR. DAVENPORT—I would say in regard to that, that I do not controvert what the gentleman said about the almost universal practice being $\frac{5}{8}$, but I wish to say here, that it will be found by examination into this matter, that the practice of a very large number is $\frac{1}{2}$, not $\frac{5}{8}$.

MR. GOODWIN—What railroad company in this country or in this part of the country uses a curve with a radius different from $\frac{5}{8}$ in.? I do not know of any.

MR. DAVENPORT—I think the Secretary can give that.

THE SECRETARY—I might ask Mr. Goodwin to refer to Figs. 1 to 15. Those are engravings made from drawings furnished by wheelmakers to our President, at the meeting we had in New York, and they are exact copies, as near as could be made from the drawings furnished by the wheelmakers, of the flanges they were making.

Fig. 1 has $\frac{21}{32}$ radius; Fig. 2, $\frac{7}{8}$; Fig. 3, $\frac{17}{32}$; Fig. 4, $\frac{19}{32}$; Fig. 5, $\frac{5}{8}$; Fig. 6, $\frac{5}{8}$; Fig. 7, $\frac{5}{8}$; Fig. 8, $\frac{3}{4}$; Fig. 9, $\frac{3}{4}$; Fig. 10, $\frac{21}{32}$; Fig. 11, $\frac{11}{16}$; Fig. 12, $\frac{3}{4}$; Fig. 13, $\frac{25}{32}$; Fig. 14, $\frac{21}{32}$; Fig. 15, $\frac{23}{32}$.

MR. GOODWIN—Is it not true that these plans are very old, and many of them obsolete? I would like to inquire of the representatives of some of the

heavy roads in the country what radius they use. On the Lehigh Valley we use ⅝. I do not know of any road in our neighborhood that uses any other.

THE PRESIDENT—We use ⅝ on the New York Central.

MR. CLOUD—We make ours ⅝.

MR. MILEHAM—I think ⅝ is the practice of the Erie.

MR. McWOOD—Our practice on the Grand Trunk is ⅝.

MR. MILLER—⅝ on the Michigan Central.

MR. FORNEY—In regard to these drawings, they were furnished, as I say, by the wheelmakers of the country at a meeting held in New York one and a half or two years ago. They were furnished by different wheelmakers, and represent the standards of the wheels which they were manufacturing for different roads. It may of course be that since that time the wheel manufacturers have changed their standards. In one case, at least, I know that that has been done. I would like to ask Mr. Davenport whether he has not been furnishing wheels of the pattern he speaks of to a great many different roads?

MR. DAVENPORT—Yes.

MR. FORNEY—I think as a matter of fact, nearly all the railroads use wheels manufactured by different makers, who have no uniform standard. My investigations have shown that ⅝ prevails more largely than perhaps any other one, but I do not think it is at all uniform so far as I have been able to see.

MR. GOODWIN—In answer to the last remark, I would say I think it is uniform. There has been no one here to state any other radius in use. I wish if any master car-builder here uses any different radius from that, he would express it. I am under the impression and belief that this use of ⅝ is universal by the railroad companies of the country at the present time, and I have yet to hear a remark to the contrary. I think, perhaps, that some wheels made in ancient times may have had a different radius, but at the present time they are all ⅝.

MR. FORNEY—I had some correspondence with Mr. Wootten on that same point. I received tracings from him at that time which were ½-inch radius, and I inquired of them whether they had any difficulty in chilling wheels. I have a blue print in my possession, which was received from him and which represents the standard used on the Reading Railroad not long ago, and it is ½-inch radius.

MR. CLOUD—It seems to be established by the Secretary's report that ⅝ is not universal, but that it is the figure which is most nearly universal. I think it is quite possible that some of the drawings which Mr. Forney received showing other dimensions were old drawings, and the only ones that the railroads could get hold of at the time.

MR. FORNEY—They were furnished by wheel manufacturers.

MR. CLOUD—I said this more with reference to the Philadelphia and Reading Railroad. I would call attention to the fact that there is no one of these cuts which shows a smaller radius than ½ in. The lowest is 1 7/16. It would be interesting to know who are the railroads that have ⅞ in. or ¾ in. Three are given as ¾; all the others, except the ⅞ and ¾ are very close to the ⅝, and several of them are ⅝.

I wish to support Mr. Goodwin's motion, inasmuch as we have gone as far

as we have in this matter, and this Convention has adopted ⅞ by letter-ballot.* I think it would be entirely improper for us to take a backward step. What we wish now is to get the superintendents of permanent way of railroads to so represent to their superior officers the necessity of having rails formed of the shape of existing wheels, so as to result in a proper combination of wheel and rail in service; and I think the difficulty of manufacturing a wheel and getting the proper chill in the throat, if the radius be only ½ in., is a serious objection. The ⅞ in. radius is small enough. We make a great many wheels at Altoona, and they are all of ⅞ in. radius. It requires constant care to keep the chill properly up, on account of the contraction drawing it away from the chill. This will probably increase as the radius diminishes.

As regards the other features of the proposed form of wheel tread and flange, I wish to say that the feature of coning it at the outer side, which is shown in the drawing at Fig. 55, corresponds very closely to our present practice, and our practice for some years past, in turning tires on driving-wheels. They are beveled off in that way. The balance of the tread is cylindrical, which agrees with the proposed form, with the exception that Mr. Forney has introduced between the straight portion and the radius of the throat a six-inch radius at the top of the proposed rail-head, which does not deviate much from a straight line. Therefore, with the amendment proposed by Mr. Goodwin, which is now before the Association, I shall be in favor of these suggestions made in the report.

MR. DAVENPORT—What height of flange is used by the Pennsylvania?

MR. CLOUD—One inch.

THE PRESIDENT—I would state as to the change in the manufacture of wheels suggested at the meeting held a couple of years ago, at the time the drawings were presented, that it tended to make a more uniform system among wheel manufacturers as to width over all, form of tread and curve at the throat of flange; so that the engravings shown here do not represent properly the practice at the present time.

The question before the house is on Mr. Goodwin's motion.

MR. WALL—I would ask Mr. Goodwin if he would object to putting in his resolution an instruction to the Secretary to alter his drawing and have it published in the proceedings, so that in the wheels we are to use during the coming year we can follow the drawing given in the report of the proceedings. I would ask Mr. Goodwin if he would object to the incorporation of that in his motion?

MR. GOODWIN—There is another point. In these suggestions, as Mr. Forney calls them, he puts a 6-inch radius at the top of the rail. Now, the radius of our rail is 10 inches. Mr. Robert Sayre drew this design in conference with the general manager of the Buffalo Iron Works, and also with the managers of rolling-mills at Troy and Pittsburgh, and they all agreed upon this shape of rail, and they have all got their rolls turned up to suit it, the idea being to introduce, if possible, a uniform pattern of rail for such a heavy rail. The radius of the top is 10 inches. Their design is to make it as nearly flat as possible. Now, if this tread of wheel is made as Mr. Forney suggests, with a radius of 6 inches it would not fit as well. I do not know whether that is a very

* Mr. Cloud was mistaken; a majority of the votes cast by letter-ballot were opposed to the adoption of the form of flange referred to. (See page 120 of last Annual Report.)

essential point. They will soon wear to fit pretty well. Before adopting that feature, I would like to hear a little discussion on that point.

MR. KIRBY—In adopting this $\frac{5}{8}$-inch radius how will our wheels be affected running on the old pattern of rail, which is about the form shown on page 8, Fig. 19? Before we adopt this radius, should not we get the men having charge of the permanent way to join us in that, and change the form of their rail at once. If we continue with the $\frac{5}{8}$-inch radius, and they with a much shorter one, it would be injurious to our wheels. I think, in this matter, we should work together, if possible.

MR. DAVENPORT—On page 5, of the report of the Secretary, we have a sketch, Fig. 22, of the standard tread used on the Reading Railroad. In this case, the corner of the rail does not touch the throat of the flange at all. I have not dividers here, but I think if it was $\frac{3}{4}$-inch radius there, it would just about fit.

MR. GOODWIN—If this motion passes, does that adopt that form of rail for our use?

THE PRESIDENT—No, sir; it simply recommends that tests be made of this, in order to arrive at conclusions.

MR. GOODWIN—The more I think of it the more I am inclined to favor the form shown here, in last year's proceedings, at page 42. I understand Mr. Cloud to say that that corresponds very nearly to what is used on the Pennsylvania road.

MR. CLOUD—I say that beveling off at the outer edge corresponds very nearly to the way we turn driving wheel tires.

MR. FORNEY—I should like before the vote is taken on this matter to make some statement as to how the matter stood at the time I undertook to write this paper. The two forms mentioned on pages 42 and 43 of the report of the last annual convention were submitted to letter ballot, and were both overwhelmingly rejected. That, of course, placed us in a position of being obliged to propose something which would meet the approval of all of the members, the condition of things being that there were a sufficient number of members who were opposed to the coned wheel to defeat that, and there were a sufficient number opposed to the cylindrical tread to defeat that. The object of my paper was to propose a form of flange which would be acceptable to both classes of people. Furthermore, during the last year, I have had intercourse with a number of railroad officers who have charge of the permanent way. I find very great opposition among those officers to adopting a radius for the corner of the rail as large as $\frac{5}{8}$ in., and I think it would be difficult to get the railroad managers of the country to adopt a radius so large as that. Inasmuch as we have to reconcile the wheel men and the rail men, it was necessary to do something different from what was proposed last year. I would also say that I have had conversations with a great many wheel men about the manufacture of wheels. I had a conversation a day or two ago with a wheel manufacturer, who urged very strongly the difficulty of making a good chill where so small a radius as $\frac{1}{2}$ in. is used. I therefore took the form of flange which, until quite recently, he was using, and I drew the one which I proposed in full lines, Fig. 57, and drew his in dotted lines. You will see from the engraving, that a curve with a radius of 6 in. connected to another of $\frac{1}{2}$ in. in the throat of the flange, approximates so nearly to one of $\frac{5}{8}$ in. radius, that it is difficult to

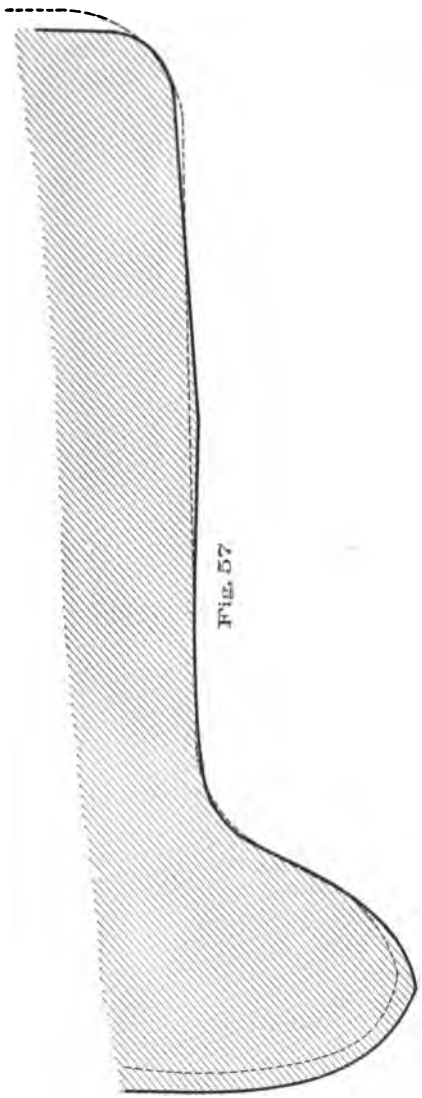


Fig. 57

show the difference without exaggerating the drawing. For the throat of the flange I adopted a compound curve of this kind consisting of one of 6 in. radius connected to another of ½ in., with the view of reconciling the conflicting views of the permanent way men and also with the hope that such a curve would meet the views of the wheel men; and for that reason it was that I changed the radius ⅝ in. to ½ in. It must be remembered that this Association cannot influence the action to any great extent of the men who design the forms of rails, and if it is determined to adopt either ½ or ⅝, I would suggest the wisdom of submitting the matter to the officers of the permanent way of railroads before coming to any conclusion about it. The members of this Association in favor of coned wheels must have their views reconciled with those in favor of cylindrical wheels. Those in favor of the form of rail with a sharp corner must be reconciled with those in favor of a long radius corner.

If I was given entire power to do precisely as I liked, and could design the rail section and wheel section to be universally used, I probably might do a little different from what I would do when I come before the community having many conflicting interests to reconcile; and therefore, I would suggest, before Mr. Goodwin's resolution is passed, that some action should be taken submitting the matter to the permanent way men and the wheel manufacturers, and get their views in regard to it before coming to any decision.

MR. C. E. GAREY—I suggest that the matter be referred to a committee, with instructions to confer with the wheel manufacturers and the officers in charge of the permanent way. Will Mr. Goodwin accept such an amendment?

MR. GOODWIN—Yes, sir.

MR. WILDER—How are we going to get at officers in charge of the permanent way of railroads? I do not know of an association of engineers of maintenance of way. It would be better for this Association to designate the officers of the different railroads or of the large railroads, or ask a certain number of railroads or those represented in the Association to designate officers to confer with this committee.

MR. FORNEY—I should say it could be done precisely as was done in connection with the preparation of that paper. A circular of inquiry was prepared, and it was sent to the master car-builder of each road with a request that he would refer it to the proper officer. Whenever in the first instance I could find out who the engineer of permanent way was the circular was sent directly to him.

MR. ADAMS—Mr. Forney referred to this vote which was taken. Now, it seems to me that that was not fully understood by the parties to whom that question was submitted. I do not believe that the men in general throughout the country fully understood what they were voting about. My impression is that there is at the present time quite a large number of roads using the form of section that was designed by our president I was going to say—I do not know whether it was or not—but produced by him at any rate, and templets were made and I know that a number of roads have adopted that, and yet in the face of that I find that we voted against it and against the cone too. Now I can understand exactly why they would oppose this and the other too. I will say that although at that time I did not feel particularly favorable to Mr. Garey's form of wheel tread, yet for the sake of obtaining uniformity of size of wheel throughout the country, I favored the adoption of his templets, and we at once

gave orders to every wheel manufacturer who makes wheels for our road to make them to our templet and I know that other roads in our neighborhood have done the same thing. In connection with supplying the various forms of wheels that different makers are making, I would say that these same founders are making other forms of wheel for other roads. Now, I will venture to say that if that vote was submitted to-day to the Association, after what has been said, and after this report of our secretary, it would pass. It is perfectly clear to me that the cylindrical form of the wheel is not any material benefit. It is the cause of the chipping out of wheels in passing frogs, undoubtedly.

MR. MARDEN—I would say that we adopted the form of wheel tread and all the wheels that we are having made are in that form, and during the past winter we have not found a single chipped wheel.

MR. ADAMS—I was very anxious indeed to have that templet adopted by the railroads of the country because I think it is well understood that if we adopt a uniform wheel throughout the country we will have very much less trouble than we have now.

MR. BISSELL—It seems to me established by the best authority that we cannot make a good wheel with a smaller throat than $\frac{5}{8}$-in. Now we all know how difficult it is to obtain good chilled wheels at the present time. If we admit to the management of railroads that they can make their wheels smaller than $\frac{5}{8}$-in. radius in the corner to fit this wheel, and we get a poor wheel by our action, we are responsible for the poor wheel. When we get to the minimum of the radius we should not under any consideration go below that and it seems to me that we ought not under any circumstances place ourselves so before the permanent waymen and the managers of railroads that they would permit a a cast wheel to be made with a throat less than $\frac{5}{8}$-in. radius.

MR. FORNEY—Is it clearly established that it would be impossible to get a good chill with a one-half inch radius? In a conversation I had with Mr. Whitney, of Philadelphia, he said there would be no difficulty whatever in getting a good chill with that radius. I do not think that that point is established by any means, and that is one reason why I think that the opinions of the wheel men should be secured before we take any definite action. I also want to repeat what I said before, that a curve of one-half inch taken in connection with a six inch corner is almost identical with one of five-eighths radius.

MR. WILDER—Will you please state in what condition this motion is now.

THE PRESIDENT—It now stands that this matter be referred to a committee.

Seconded.

MR. WALL—I think that we want to take advantage of the opportunity to experiment with this new form of wheel section, and if this committee will report, if they are given the power to report, the result of their conference with the maintenance of way people, why then we can have some wheels made in accordance with their suggestions, and when we come together next year we will be able to talk with some experience on the matter. They can either give the result of that by a circular, which they can send around to the various car-builders, stating that they would recommend that some wheels be made in accordance with the following recommendations—just as Mr. Forney suggests at the end of his report; only let the committee give that suggestion, instead of adopting the suggestion as it stands now.

MR. DAVENPORT—As the tendency has been and is to lower the height of the flange and increase the radius at the throat of the flange—for that, I suppose, no one will question who remembers the old form of car-wheel—would it not be wise, in sending out a circular, to send out the two plans proposed ? Let wheels be made on both plans, and let us abide by the results which are obtained from these two different forms of wheels. I am entirely willing to submit this to practice. If the plan proposed by the one party is better in practice than that proposed by the other party, we simply revise our theory to conform to the practice, and we are always safe in doing that. I haven't any hobby about this matter ; it is only that the progress of events points towards a lower flange and a larger radius in the throat to secure the best results in wheels. Now, if this committee can procure a test to be made from wheels, made from the same iron by the two forms, I will abide by the result. If the form with a ¾-in. radius and an inch flange does not beat the other, why, then I have nothing to say. If it does you will see that you want the improved form of wheel, I think.

MR. WILDER—As I understand Mr. Forney's motion it is that this committee be appointed to confer with the wheelmakers and maintenance of way men and suggest the form of flange and rail head and I suppose that it will be perfectly competent for them to propose more plans to be tried than one.

MR. LENTZ—I move that the matter be referred to the Committee on Sharp Flanges.

Seconded.

MR. WALL—I want to object to Mr. Lentz's motion. I think that would be hardly fair to Mr. Forney, who is not a member of the Committee on Sharp Flanges, and he should certainly be the head of this other Committee.

MR. FORNEY—I hope that both Mr. Lentz and Mr. Wall will modify their motions, and as Mr. Goodwin has been the Chairman of the Committee on Sharp Flanges, I think it is proper he should remain chairman.

MR. BLACKALL—I think the Committee on Sharp Flanges should have something to say on this subject. You have kept us on that Committee for about four years, and now you propose to continue us, and the Committee wish to ask that they be excused from further service. I think it is wrong to hold us on that Committee any longer.

MR. BISSELL—This is a very important subject and I think that the Committee who have now learned something about it ought to be continued, I think they ought to be encourged to go on with their efforts.

MR. BLACKALL—The Committee certainly have been encouraged.

MR. WALL—I move that this committee consist of Mr. Forney, Mr. Goodwin, and three other members to be named by the president.

MR. McILWAIN—I do not think it would be a bad idea to include in that committee a maintenance of way man, if we have one among our members.

Mr. Wall's motion was carried.

THE PRESIDENT—The next thing in order will be the report made by our Committee on Trucks.

MR. BLACKALL—The Committee on Sharp Flanges is ready to report.

REPORT OF THE COMMITTEE ON SHARP FLANGES—THEIR CAUSE AND PREVENTION.

Your Committee appointed at the annual meeting of 1882, and continued at the annual meeting of 1883, with power to confer with other railroad officers, etc., as stated, would report that they have not so conferred with the officers named, for the reason that before doing so they learned from the Secretary that he had in preparation a paper on the "Relation of Railroad Wheels and Rails to each Other," and as this includes the points upon which your committee would confer, we have thought it best to defer action until after the presentation of the paper prepared by the Secretary. We would further say, that having listened to this able paper, and to the very interesting discussion thereon, by members of this Association, and by the officers of permanent way in attendance by invitation at this Convention; and considering that the whole subject has been brought before the Association in a very able and exhaustive manner, we ask that we be relieved from further consideration thereof, and that our committee be discharged.

Respectfully submitted,

H. S. GOODWIN,
R. C. BLACKALL,
JOHN W. CLOUD,
} *Committee.*

MR. WALL—Before this matter goes over, is it thoroughly understood that this committee are going to report either by circular or in some other way to the members of the Association the result of their deliberations, so that we can make some wheels in accordance with their recommendations, and be able to talk about them when we come here next year? I want that to be understood, and if it is necessary I will put it in the form of a motion.

THE PRESIDENT—I think it would be safe to leave that in the hands of the Committee.

MR. WALL—I would move that the members of the Association be requested by the Committee to try the form of the wheel sections recommended by them, and report on the results at the next meeting.

Agreed to.

THE PRESIDENT—The report of the Committee on Standard Trucks is now before you for discussion.

MR. BLACKALL—The Committee on Sharp Flanges has made its report. What is to be done with that?

THE PRESIDENT—Let us first dispose of the business before the house, which is the standard truck, and then the report of the Committee on Sharp Flanges will be considered. The report of the Committee on Trucks should be received and the Secretary instructed to engross it in the minutes.

MR. BISSELL—I move that the report be received.

THE PRESIDENT—Is the motion that the report be received and the engravings made and spread upon the minutes ?

MR. BISSELL—Yes.

The motion was carried.

On motion, the report of the Committee on Sharp Flanges was received and the recommendation of the report adopted.

THE PRESIDENT—Is the Committee on Brake Shoes and the Interchangeable Parts of the Brake Arrangements of Cars ready to report ?

THE SECRETARY—Yes; the report is in the hands of the Secretary.

The report was read by Mr. Packard, as follows:

REPORT OF COMMITTEE ON BRAKE-SHOES, BRAKE-BEAMS AND THE INTERCHANGEABLE PARTS OF THE BRAKE ARRANGEMENTS OF CARS.

The committee appointed to make a report on this subject prepared the following questions, which were embodied in a circular which was sent to all the members of the Association. A summary of the answers received is given after each question.

1st. With your experience, what do you consider the most economical brake-shoe, wrought or cast iron, or the so-called "Congdon Shoe" (which is a combination of both metals) ?

Nine members said they preferred cast-iron shoes; eight preferred the Congdon shoes; four wrought-iron shoes; one preferred shoes made of gun metal, and three did not know what they did want.

2d. Do you think that the so-called "Congdon Shoes" are better than either cast or wrought iron shoes ?

The answers to this question were about the same as those to the preceding one, with the exception that two of those who replied claimed that wrought-iron and Congdon shoes had about the same relative qualities.

3d. Do you think truss-rods applied to brake-bars are useful ?

Those who answered this question approved of truss-rods for passenger cars, but considered them too expensive for freight equipment.

4th. Would you recommend either iron or steel as a substitute for wooden brake-bars ?

Fourteen members preferred wooden brake-beams; some wrought-iron, and three preferred steel. Among those who

thought best to continue the use of wood, there were several who thought that ultimately a metal bar would be adopted.

5th. What do you consider the best: solid break-heads and shoes combined, or independent heads and shoes, made so that shoes may be removed from the heads and renewed?

Twenty-one of the members thought break-heads independent of the shoes were most desirable, and four preferred a head and shoe combined in one piece.

6th. What do you consider the safest and most durable way of hanging up brakes?

Nearly all of those who expressed an opinion preferred that brakes should be hung from the bottom bolster between the wheels. There was but one person who did not agree with this opinion.

7th. Would you recommend that brakes be applied to both trucks of each car and if so, should they be connected?

Nearly all recommended brakes on eight wheels and connected to one brake-staff.

8th. Do you think that the Congdon shoe wears or cuts steel tires more than cast-iron shoes?

Of the twenty-five who answered this question, twelve had no experience with the Congdon shoes, nine thought that they wore steel tires more than cast-iron shoes do, and four had no evidence that they did not, but were not certain about it.

9th. Would you recommend what is known as the "Christie" brake-head for adoption? If not, will you state what in your judgment is the best break-head and shoe?

The expressions of opinion regarding the various shoes were as follows: Six preferred the Collin shoe, which is used on the Pennsylvania Railroad, four the Christie shoe, three the Standard, one the Fowler, and one what he said was known in the western country as the "reversible hook." There were three who preferred a standard head and shoe, but did not specify any special kind.

In reviewing the subject, your committee are of the opinion that there would be great economy if standards were adopted of as many of the parts required to hang up brakes as possible, but on account of the great diversity of opinion on the subject, we

are unable to determine from data obtained which would be the most valuable to recommend to the Convention, but would call the attention of the Convention to the necessity of standards, and think it would be of great importance and of great advantage to have some of the parts decided upon and turned over to the Executive Committee for final consideration.

L. PACKARD,
JOHN S. LENTZ,
J. W. MARDEN,
} *Committee.*

MR. WALL—I would move that the report of the Committee be accepted, and that they be continued with instructions to give at our next meeting some form of brake-shoe and brake-head, which they consider the best, so that we can take it up and discuss it.

Seconded.

MR. MARDEN—As one of the committee I am ready to recommend a brake-head for adoption, and have been for some time. I should recommend the Christie head and shoe, and that would be my opinion if I were continued a year.

MR. PACKARD—If that motion should pass, we ought to add Mr. Wall to the committee, because I am sure he would recommend the Pennsylvania shoe, and then there would be an opposition in the committee.

MR. WALL—I am not prepared to say that I would recommend that. I want to recommend something that will be adopted by all parties. I do not want to be on the committee; but I want to repel the insinuation that everything we say must be Pennsylvania. We do not come here in that mood. We come here to give a little and take a little.

MR. McILWAIN—I think now is the time to settle this question. I do not care what is adopted. If it is anything reasonable, I am ready to take it up at once.

MR. ADAMS—I suppose Mr. Marden would have as reasons why the Christie shoe should be adopted, first that he likes it better than any other and secondly that it is reported here that a larger number of that kind is used than any other one kind. I am free to own that I prefer it to anything else. I think some fifty roads reported here that they used the Christie shoe. If it were adopted it would be necessary to bring it into a little more uniformity than it is in at present. Hardly two roads have their patterns alike, so that they will interchange; so that there is really as much trouble with that as with the others.

MR. WILDER.—We have a standard brake-shoe on about thirty thousand cars, while we have to make as many brake-shoes for foreign cars as we do for our own of other patterns, and I would be perfectly willing, although I should not want to change our patterns, to allow our cars to be supplied with the standard brake-shoe that should be adopted by this convention to be received back on our road with a brake-head in lieu of our own, and might possibly be willing to give up our own standard and take the brake-shoe adopted by this Association.

MR. PACKARD—As I had all the correspondence relating to this subject, I find that the Christie shoe is confined almost entirely to New England, and

there seems to be a great diversity of opinion relative to it. I am inclined to think that the Christie shoe is a good shoe, and as its patent has expired, it seems to be the most available one now for the committee to recommend, although I have no doubt that those parties who have patented shoes would be very glad to have us recommend one of theirs.

Mr. Wall's motion was carried.

THE PRESIDENT—Is the Committee on Standards and Appliances for the Safety of Trainmen now ready to report?

MR. KIRBY—I think the invitation to that committee was not put exactly in those words, if I understood it right. I was a committee of one to prepare a circular to present to railroad managers and others, with the view of recommending them to adopt those standards which had been prescribed by the Association, but it is so difficult for myself or any other man to know what our standards are, that I refrained from taking any action. I do not know that we have got anything but the axle and the journal bearing and journal bearing key. I guess that is about all the standards we have. As to the other appliances recommended by the Committee at Chicago in 1879, there are a few roads who have taken them and adopted them. For instance, I find a new car down here, built by our worthy president, with the handles vertical, and no handle on the other corner for the yard men to take hold in the performance of their duties. I think the recommendations of that Committee were that the handle should be placed horizontally, and that there should be another handle on the opposite corner for the men to take hold of while they are following the car and pulling the pin with the other hand. If the members of the Association themselves do not adopt these recommendations, I do not know that it is of any use to present them to the general managers and superintendents. On that ground, the committee has not any report to make.

MR. LENTZ—I move that the Committee be continued with request to report at the next meeting.

Agreed to.

MR. KIRBY—We were all of us aware that some changes would have been recommended at this meeting, which would place any report that this committee could have made, in rather an embarrassing position, for instance, at our meeting yesterday we took back some things that we voted on at other meetings. Now, that these corrections have been made, such a committee can act more understandingly than they could before.

THE PRESIDENT—Is the Committee on Piecework in Building Freight Cars, ready to report?

MR. VERBRYCK—Read the report of this Committee, as follows:

REPORT OF COMMITTEE APPOINTED TO MAKE A REPORT ON PIECEWORK IN BUILDING FREIGHT CARS.

Your Committee, appointed to make a report on piecework in building freight cars, sent out the following circular of inquiries:

To the Members of the Master Car-Builders' Association:

1st. Have you ever built freight cars by letting out different portions of the car by the piece? If so, did you find that the work could be done cheaper than if done by the day?

2d. Would you recommend letting out the whole car to one man or letting different portions to different men? Or would you let out the wood work to one and the iron work to another?

3d. In your opinion, would the same shop room and facilities produce more work if let out by the piece than by the day?

4th. Please state how, in your opinion, the work would compare, if done by the piece with that done by the day?

5th. If you have built freight cars by piecework and found it cheaper than to build them by the day, please state as near as possible how much less per car (taking box cars, for example,) they can be built for than if built by the day?

You are requested to give any other information which will assist the committee in making an intelligent report on the subject submitted to them.

Replies to this circular should be addressed to B. K. Verbryck, Chairman of Committee, Car Shops, Chicago, Rock Island & Pacific Railway, Chicago, Ill.

B. K. VERBRYCK,
JOHN KIRBY,
W. B. SNOW,
} *Committee.*

Nineteen replies were received to this circular, as follows:

1st. Fourteen answer that they have never built freight cars by piecework. Three answer that they build cars by piecework and find it costs less than by the day. One answers that he does not build any new cars at his shop but all repairs are done by contract. One answers that he does not at present build any cars by piece, but that on a road he was formerly connected with they built by piecework and found it could be done much cheaper than by the day.

2d. Fifteen answer that they would recommend letting out different portions to different men. Three answer that they would not recommend letting out cars by the piece in any manner. One answers that as he has never built cars by piecework, he cannot give any information on the subject.

3d. Twelve answer that more work would be produced by the same shop room and facilities if let out by the piece than by the day. Four answer that there would not. Two do not think it would make any difference.

4th. Eight answer that the work should be as good if done by the piece as by the day, if properly inspected. Four answer that it would not be as good. One that piecework would not compare by 20 per cent. with work done by the day.

One answers that day's work should be 25 per cent. better; one does not favor piecework at all; four do not answer this question.

5th. Eight answer that they cannot tell, as they never built

cars by piecework; one, that the work can be done 35 per cent. cheaper by the piece than by the day; two say 25 per cent. cheaper; one, from 15 to 20 per cent. cheaper; one, from 5 to 25 per cent. cheaper, according to facilities; one, $2 per car cheaper; one, $5 per car cheaper; one, $8 to $10 per car cheaper; three do not answer this question.

As none of your Committee have had any experience in building cars by piecework, they have thought it best to submit a synopsis of the replies received to circular of inquiries with some extracts from the few answers received from those who have had experience in contracting out cars to different parties.

One writes that he was employed a few years ago in a contract shop; that the first year he was there all the cars were built by day's work. The second year all the work was done by the piece, and he had it done 25 per cent. cheaper, and just as well; that it did away with a vast amount of contention among the men, as each man was paid according to his ability and the amount of work he performed, and that the men did not look around the shop for an easy job as formerly, and were not as anxious to hear the whistle blow as they were when they worked by the day, etc.

Another writes that he is building freight cars by letting out different portions to different men, and the work can be done from $8.00 to $10.00 per car cheaper than by day's work, that the work will compare favorably with work done by the day, but it must be properly inspected.

Another writes that he would recommend that all new work in repair shops be done by the piece and thinks it could be done with economy if there was a sufficient quantity of work to keep a gang of men constantly employed, and can see no reason why the work should not compare favorably with day's work if done under proper supervision.

Another writes that he does not build any new cars at his shop, but all repairs are done by contract; that his men, who do the wood work, work in gangs of four, and the iron work is also done separately, by contract; that he can in this manner turn out about 30 per cent. more work than by the day's work system. That the work done in this manner is just as good, as he has good inspectors, and if the work is not done properly they have to do it over again at their own expense.

Another writes we build freight cars by letting out different

portions by the piece, and find that the work can be done cheaper than by the day, and he says he estimates that it will cost about $2.00 per car less than if built by the day. (Which your Committee consider rather too small a margin to make it of much account.)

Another writes that he has been building freight cars by the piece the last ten months, and finds it can be done cheaper than by the day by letting out different portions to different men; that an ordinary box car can be built at least $5.00 cheaper than if done by day's work.

Another writes, that on the Pennsylvania Railroad, with which he was formerly connected, they found that the work could be done much cheaper by piecework than by the day. That they found the best results could be obtained, not by letting out the whole or portions of the car by contract, but to have a price for each detail of work, as for instance, a certain price for draft-irons, brake-rods, follower-plates, etc. For turning up axles, for fitting wheels, for casting journal-boxes, centre plates, columns, slides, etc. He is of the opinion that piecework could not be advantageously introduced in planing mills, but after all the material is brought together, by laborers, a certain price can be assigned for erecting the car, another for fitting it with doors, and another for painting; each man to be paid by the company for the work he performs, with the exception of the erecting gangs, which would be composed of from three to six men, who would receive their money in bulk, to be distributed among themselves, and that piecework carried on in this manner, in his experience, increases the amount of work turned out, and if properly inspected, will be more satisfactory than when done by the day, and can be done about 35 per cent. cheaper.

Another writes that he would compare the work done by the piece with similar work done by contract builders, under a low contract, *plenty of it such as it is.* He thinks day's work will produce the best results for the company.

B. K. VERBRYCK,
W. B. SNOW,
JOHN KIRBY,
} *Committee.*

On motion, the report was received and ordered to be spread on the minutes.

MR. VERBRYCK—I have no doubt that we could build cars cheaper by letting out different parts than to build by the day's work. I see no reason

why it could not be done as well under proper supervision. I have never so far brought this to a system in my shops. I do not know but that I may some time. Other men have had experience in that line, and I would rather hear from them. I would add, that I have in building freight cars given our men so much time for their work. I have found that they would put them up more quickly, and in a week's time would gain a car. Sometimes they would not gain as much as that in a week.

THE PRESIDENT—I would call for the report of the Committee on Plans for Car Shops and the Arrangements for Car Shop Machinery.

THE SECRETARY—The report is not in the hands of the Secretary. Is Mr. Blackwell ready to report?

MR. BLACKWELL—As Chairman of this Committee, I reported progress to the Secretary, on account of having received only one or two replies to the questions contained in the circular of the Committee. These were not sufficient to enable me and my colleagues to make a satisfactory report.

MR. VERBRYCK—I plead guilty to not answering that circular myself. I want to answer every circular; but in this case the information called for by the circular could not be given in less than a year's time. The Committee called for plans and specifications in connection with car shops, and I had no time to get at anything of that kind.

THE PRESIDENT—Perhaps it would be well to continue this Committee.

MR. DAVENPORT—I move that the Committee be granted further time.

MR. ADAMS—I am utterly ignorant of this matter. I have to plead guilty, as Mr. Verbryck says, in not answering the circular. I cannot see why this Convention should spend time on this question. If a road has thirty or forty thousand cars, they need a very different shop from a road that does not have but two thousand cars. And then all shops are built under different circumstances, and their surroundings have to be taken into consideration in relation to the buildings which are put up. I cannot see how we are going to adapt ourselves to the wants of any special road or place. I do not see any need whatever for the Convention wasting time on a subject of this kind. If any road wants a shop, they will build it on plans most suitable to themselves, and it will not make any difference what we say on the subject.

MR. CLOUD—I am very glad to hear Mr. Adams speak in this way. I do not see that the subject is at all pertinent here. I think if any one wants to build shops, whoever has the responsibility will look the matter up; and I should be in favor of discontinuing this committee. I think there are other matters of much greater importance to which this Convention can give its time. I know it is not very encouraging to the committee after they have commenced to work, but I am very glad to learn that they have not done much. I did not answer the circular, and I never shall. There are questions in it which I have not the right to devote time enough to answer, and attend to my duties as an employee of the Pennsylvania Railroad Company.

The same remarks would apply to the Committee on Piecework. I do not think that that is a subject that it is proper for this Association to deal with at all.

MR. VERBRYCK—I must confess, when I received the appointment of chairman of that committee I was entirely at sea what to do. I sent to our worthy Secretary for information, and he said he did not know any more than

I did, and he referred me to Mr. Forsyth, as the Chairman of the Committee on Subjects. I wrote, and with the information I could get, I have done the best I could, but I really do not consider it a subject for us at all.

MR. WALL—As one of the committee to which Mr. Verbryck refers, I would like to say that Mr. Forsyth and his committee were appointed for subjects for the ensuing year, not for this year. We are not responsible for what has been done. It is somebody else's funeral.

MR. BISSELL—I would like to inquire if Mr. Cloud made that as a motion.

MR. CLOUD—I did not because I did not know that it would be in order.

MR. BISSELL—Then I should like to make it as a motion. I do not think it is more pertinent to the business of this Association than would be a committee to determine which are the best mechanics—Democrats or Republicans.

MR. ADAMS—I do not know who the committee were who presented that subject for discussion, but I was utterly surprised when I got those circulars, because it looked to me as though it was a matter that was entirely beyond our control or even interest so far as we act as a convention. It is a matter in which each party will act according to his own interest and pleasure.

The motion to continue the committee was lost.

THE PRESIDENT—Is the report of the Committee on a System of Lettering and Numbering of Line Cars ready to report?

THE SECRETARY—The report is in the Secretary's hands.

Mr. Soule read the report.

REPORT OF COMMITTEE APPOINTED TO PROPOSE A SYSTEM OF LETTERING AND NUMBERING LINE CARS.

Summarizing the replies recently received to the printed circular of inquiry issued by your committee, it is to be noted that the very strongest objections are offered to putting any more lettering or marking on the sides and ends of box-cars than is absolutely necessary for the proper record of their ownership and movement. A large majority of those who have answered the circular also strenuously objected to having more than one number appear anywhere on a given car. It appears that in most cases the "Fast Freight Line" number and the ownership number are identical, but in some they are not. The preference of the majority seems to be that the owner's number should be reserved as a matter of office record only and should not be allowed to appear on the car, inasmuch as it is sure to cause more trouble than it will save. There seem to be wide differences of opinion as to the advisability of putting car numbers and initials on the doors of box cars.

Carefully weighing and balancing all the opinions which have been received, your committee feels justified in offering the following rules for marking cars in "Fast Freight Line" service.

1st. The half of sides of cars on which the doors do not slide, to show the name of the "Fast Freight Line" (spelled out in full) and the car number (in the Fast Freight Line series) immediately below it. In the same panel and within two feet of the sill shall appear (in letters not over four inches high) the name of the railroad company owning the car, followed by the word "owners"; and between the same and the sill shall appear the light weight of the car with such other information as it is found advisable to give in connection with same.

2d. The doors should have no marks whatever.

3d. The ends to show the initials of the "Fast Freight Line" with the car number (in the Fast Freight Line series) just below them; no other marks will appear on ends of car.

4th. The half of sides of car on which the doors do slide, to be reserved for advertising symbols or trade marks where used. The use of profuse lettering in this panel is to be discouraged, however, and it is recommended that only the simplest trade marks or advertising signs should be used; the capacity of the car to appear near the sill in this same panel.

The circular issued by this committee stated that record of these "Fast Freight Line" cars was always kept in the name of the Fast Freight Line. The committee have since been advised by responsible members of the Car Accountants' Association, that this is not the case and that there are a number of "Fast Freight Lines" now running which require that the mileage of their cars shall be reported directly to the road owning and contributing same.

Your committee also beg leave to submit a standard system for lettering all other box cars (not in Fast Freight Line service) as follows:

1st. The half of sides of car on which the doors do not slide, to show the name of the railroad company, with the car number immediately below it; it is preferable that the name of the railroad company should be spelled in full; where this is not done, however, it is urged that immediately under the car number should appear, in small letters not over four inches high, the name of the owning road spelled out in full; the light weight of car, with such other information as it is necessary to give in same connection, to appear near the sill and in the same panel.

2d. The doors of the car to have no marks whatever.

3d. The ends of the car to show the initials of the railroad with car number below them. No other marks to appear on ends of car.

4th. The half of sides of car on which the doors do slide to have no marks whatever (except in case of local freight lines, which may be referred to in this panel) except, of course, the capacity marks, which will be near the sill and in same panel.

Respectfully submitted,

R. H. SOULE,
L. GAREY,
L. PACKARD,
} *Committee.*

MR. LENTZ—In order to avoid any confusion or difficulty for the number takers in getting the number of the car, I would move to strike out the words: "the half of sides of car on which the doors slide," and insert: "on the right hand side of the door." The idea is that the number takers, as this now stands, would have to see which way the door slides, and then to take a second look in order to get the number. This would simplify the matter, I think, as doors slide both right and left. Most of them, I believe, slide to the left.

MR. McILWAINE—Another improvement on that is in the light weight of the car. Why not have the capacity and weight; why not have them all together?

MR. WALL—I move that we take up these rules one by one, and pass upon each as we go along.

Agreed to.

MR. SOULE—I presume that the remarks of the gentlemen who have already spoken, may be construed as bearing on the first section, and I would like to answer some of their objections. Mr. Lentz suggests a certain panel, right or left, as the proper place for the initials and car number. You will remember that this whole movement originated in the Car Accountants' Association, who sent a committee to the Car-Builders' Convention a year ago. The whole business was referred to your Committee, and that Committee have had a good deal of correspondence with the Car Accountants since that time, and all the correspondence and conversation with them indicates that they wish to make this a very strong point; that the central marking should not be obscured by the door. As cars run both light and empty, when running light the door is liable to be opened and the lettering obscured; and I think that car accountants, agents and conductors and such as have to take the numbers of these cars under difficult circumstances, would make a stronger point of that than of having them located in any one particular panel, that is, as either right or left.

Then in reference to the objection offered, that the capacity marks and the light weight should be put in the same panel, the Car Accountants also made a particular point of that—that they should not be in the same panel. They said that the light weight should be in the panel where the car number is given. On the other hand, the capacity mark is something which does not concern conductors in the least. It is purely for the information of agents and is not made

a matter of daily record. It is not identified with the movements of the cars in the least.

MR. WALL—I would move to accept that rule as it stands, erasing the words "followed by the word 'owners'." My reason for doing this is that a number of the roads hire cars from companies such as the United States Rolling Stock Company, who are virtually owners, and who would object to the use of the word as descriptive of the party who hired the car.

MR. KEELER—I would like to ask what he would suggest in place of that.

MR. McILWAINE—I do not think that the Rolling Stock Company would object to that language at all.

MR. CLOUD—I think we ought to hear from the Chairman of the Committee as to why that word was put in there.

MR. SOULE—That suggestion was taken from one of the replies received by the Secretary, and it was the only reply received on the subject. The others did not touch on it. Therefore it was unanimous. The committee are perfectly willing to recommend the omission of the word "owners."

A GENTLEMAN—I would like to ask the difference between owners and lessees. If a company lease a car, are not they as much responsible for it as if they were owners?

THE PRESIDENT—There are a great many companies running cars that do not own them, while at the same time they are responsible for the cars and for the repairs of the same. Taking out the word "owners" and initials of the car as stated, it appears to me would cover all the ground.

MR. DAVENPORT—There is a vital objection to putting the word "owners" there. Thousands of cars are owned by car trust companies. You have no right to require a company to advertise themselves as owners, when you will see on a company's iron plate perhaps not three feet away the fact that somebody else owns the car.

The motion to strike out the words, "followed by the word 'owners,'" was carried.

The second section was read.

MR. McILWAINE—I would like to ask why the doors should have no marks?

MR. LENTZ—I do not suppose there is any objection to putting the number on the inside of the door.

MR. KIRBY—I agree with that part of the report. My idea is that freight car doors should be made as uniform in size as possible, so that they can be put on any car on your line. But if it is plastered all over with numbers and names and literature of different kinds, why it would not belong to that car. Therefore my idea is to make the door plain so that it can be put on any car that it will fit.

MR. CLOUD—I move that the second section be adopted as it stands.

Agreed to.

The third section was read.

MR. WALL—I am opposed to that. In a great many cases, where the car is dropped down on to scales, the weighmaster can set his beam with the weight that he sees stenciled on the car. That is, he can very nearly set it to the thousands, and get it up to the hundreds when it is on the scale. It aids him materially in that. Therefore I would move that rule 8 be changed to read: "The ends to show the initials of the railroad company, with the light weight. No other marks will appear on ends of car."

I would like also to alter that so as to read: "The initial of the road, the number of the car and the light weight." The mileage of most of the co-operative lines is reported to the owners of the cars now, and it is not any convenience to the weighmaster or conductor to know that that belongs to a fast freight line.

MR. SOULE—On the contrary, I think that is the record which the weighmaster would wish to make. The car has an identity as a fast freight line car, and that identity ought to be preserved all through, and this proposed introduction of the name of the owning road was only suggested to facilitate the mere recording of the mileage of the cars, with which the weighmasters have nothing to do. I think that the initials of the fast freight line with the number of the same immediately below, and the light weight, would make the proper combination. Our report did not recommend placing the light weight on the end of the car, but it was very evident that it was a good thing.

MR. WALL—I will not take exception to this rule as it stands now, if the Committee will agree to the introduction of the light weight.

MR. SOULE—I am in favor of that, if the other members of the Committee are: "The marks at the end of the car shall give the initials of the car, the car number, and the light weight."

Agreed to.

Section 4 was adopted as printed.

The first section of the part relating to the lettering of the cars for local service was read.

MR. VERBRYCK—I am opposed to that, inasmuch as almost all the cars in the country are lettered now with the name of the road or with the initial of the road on one side and the number on the other. I can see very little use in putting the whole name of the road in full in small letters, providing the initials of the road are such as no other road has. I agree that the name ought to be spelled in full where the initials are alike or very nearly like those of any other road. But where that is not the case, I can see no necessity for having the name written out.

MR. SOULE—Of course, it ought to be understood in connection with this that this part of the report was entirely gratuitous. The car accountants did not offer any suggestions on this subject at all, and your Committee merely lugged this in. If you like, you can cut it off as not belonging to the report, but it was put there to see what stand you would take in reference to the matter. I think that the same argument will apply, though, to concentrating the information in one panel, as applies to the case of these freight line panels, and that is the best proof that the car accountants would support us in this scheme for lettering the box cars.

The section as printed was adopted.

The second section was adopted as printed.

The third section was read.

A GENTLEMAN—I move that that be accepted, with the amendment, and the light weight."

Agreed to.

The fourth section was adopted as printed.

On motion, the report was received and the committee discharged.

The Convention then adjourned until the following day.

THIRD DAY'S PROCEEDINGS.

The President called the Convention to order at 10 A. M.

On motion, the reading of the minutes of the previous day's session was dispensed with.

The Auditing Committee presented the following report:

REPORT OF AUDITING COMMITTEE.

"Your Committee beg leave to report, that having examined the accounts and vouchers of the Treasurer of the Master Car-Builders' Association of the past year, we hereby certify that we find them correct."

W. R. DAVENPORT,
ROBERT MILLER,
J. H. F. WIERS,
Auditing Committee.

On motion, the report was received, and the Committee discharged.

THE SECRETARY—Before the regular reports are taken up, I will call the attention of the Association to some things on which I think some action should be taken. I do not think there are at the present time sufficient checks on the Secretary of the Association in the collection of dues. As things are at present, it would be easy for him to abstract a considerable portion of the funds of the Association, and it would be extremely difficult to find it out. I therefore think it would be a good plan to publish with the annual report a list of the names of members of the Association, with the amount they have paid. I have therefore prepared this resolution:

Resolved, That the Secretary be instructed to publish, as part of the Treasurer's Report, the names of all persons, and the amounts which they have paid to the Association.

Agreed to.

THE SECRETARY—There is still another matter. The Constitution provides that the letter ballot shall be sent out by the Secretary to the different members of the Association, and that those received within sixty days of the time they are sent out should be counted by him. It is quite possible and conceivable, that a case may occur where the letter ballot may be extremely important to many members, and I can conceive of cases where people would be very ready to pay a considerable amount of money to have the vote one way or another, and I think that is putting a temptation in the way of the Secretary which should be removed.

I would therefore propose, that the names of persons voting on the letter ballots and their votes should be published when the announcement is made, and with that end in view I have prepared the following resolution:

"*Resolved*, That in the announcement of the results of any vote on any question which has been submitted by this Association to decision by letter ballot, the Secretary be instructed to give the names and the votes of all the members who have cast ballots."

Agreed to.

Mr. Cloud read the report of the Committee on Standard House-cars, to Carry 60,000 Pounds, as follows:

REPORT ON A STANDARD HOUSE-CAR TO CARRY 60,000 LBS. OF LADING.

To the Executive Committee of the Master Car-Builders' Association:

The Committee appointed at the last annual meeting to confer upon a standard house-car whose maximum load shall be 60,000 pounds, and to report thereon to the Executive Committee (*see page* 113 *of last Annual Proceedings*), would report that they have so conferred together and have agreed substantially upon the dimensions of many of the different parts of such a car. As a partial result of their labors, they have on exhibition at this place three such cars, to which they invite the attention of the members of the Association and of all who are interested in the matter. The Committee would esteem it a favor for any member or interested person to criticise these cars freely and to make suggestions to the Committee, either verbally or in writing, of any improvement or change for the better which may occur to him.

The Committee consider that the work before them is an important one, and that their labors in it have only commenced.

They earnestly recommend that the Association continue to give attention to this matter in such way as the Association may think best.

Respectfully submitted,

H. STANLEY GOODWIN,
JNO. W. CLOUD,
L. GAREY,
F. M. WILDER,
L. PACKARD,
WM. MCWOOD,
ROBT. MCKENNA,
} *Committee.*

MR. LENTZ moved that the report be received and the committee continued.

MR. CLOUD—This Committee would be pleased if the members would express some opinion on the three cars on exhibition here. It may be that some of you have preferences for one style or another, and if this Committee is to be continued it will aid them very much if they can get some expression of opinion from the Association at this time.

THE PRESIDENT—I would request that the members examine those cars and find what fault they can with them, and suggest any improvements and forward the same to the Chairman of the Committee

The motion to receive the report and continue the Committee was carried.

Mr. Cloud read the report of the Committee on Freight Car Framing and Trussing.

REPORT OF COMMITTEE ON FREIGHT CAR FRAMING AND TRUSSING.

The Committee on Freight Car Framing and Trussing has held three meetings and obtained from various sources all the information it could bearing upon the general subject. The Committee did not think best to issue any circular of inquiry, but instead it obtained drawings showing the practice of a number of large railroads throughout the country in this respect. After examination of these drawings the Committee deemed it best to represent the most general practices by three models, which are submitted with this report and referred to as models Figs. 1, 2 and 3, Plate VII. If the Committee succeeds in indicating clearly the good and bad points of these three systems of framing and in showing where some improvement may be made in cars of modern capacity, they will feel that the object in appointing the Committee has been fulfilled.

Model Fig. 1 represents what has been in times past the almost universal practice, so far as the general features of the design go. It is still the plan most generally used, but frequently with two less panels than shown in the model. This style of framing appears to have given reasonably satisfactory results before the introduction of cars of the present increased size and capacity, but that it is not as well adapted to these large cars is indicated at least by the existence of a greater variety of types, the most important of which will be referred to in models Figs. 2 and 3. In the opinion of your Committee the principal defect in the frame shown in model Fig. 1, for modern box and stock cars, is the lack of endwise stability of the house, due in turn to imperfect side framing, as each individual panel considered alone may be dislocated by some endwise shock against the underframe, as each panel is braced in but one direction, and there is nothing in it to prevent elongation of that diagonal and the shortening of the other diagonal.

We are well aware that the usual argument is that the car is made stiff in both directions, by the fact that the braces are inclined in opposite directions on the opposite sides of the car door to the bolsters. We are of the opinion that this has some stiffening effect but that it is insufficient to properly secure each panel from distortion by the inertia of the house and its load when the car receives a heavy shock in the line of draft, and that it is essen-

tial for durability that each panel should be so braced or tied as to be perfectly free from distortion under the various shocks which the car receives in active service. It seems to us that the life of a car body and the maintenance of shape are largely dependent upon this matter, and that it is also important that this practice be carried out in such a manner as will add the greatest amount of stiffness to the car sides laterally, so as to prevent their bulging out under pressure of the load.

Model Fig. 2 represents the practice on some roads which looks like an attempt to meet the very difficulties above referred to, as it contains in addition to the framing shown in model Fig. 1, tie-rods and eight panels running along the opposite diagonal to that occupied by the braces. It also contains an additional post in the middle of each panel extending from the side sill to the belt rail only. The tie-rods are used presumably to stiffen the car endwise, and the short posts to stiffen the sides laterally, but your committee would call attention to the fact that any panel with the brace in one diagonal and the tie-rod in the other diagonal, can still be distorted by lengthening of the former diagonal and shortening of the latter, and there is nothing in this framing to prevent just such an occurrence. Further, the additional short posts cannot add much lateral stiffness to the car sides, as one end is secured to the brace at or about its weakest point. It seems to us that any combination of Pratt & Howe trusses, such as this, is radically wrong for the reason above indicated, and that the diagonals should both be braced or both be tied to insure rigidity of the panel.

Model Fig. 3 exhibits another style of framing in use, apparently designed to overcome the same difficulties. This framing has posts only at the ends and at the doors, but has braces and ties alternately and with opposite inclinations, without any intermediate posts. By considering the strains in this framing we cannot see any reason for greater stability from the shock than in models Figs. 1 and 2. We think that the lateral stiffness of the sides must be inferior to both of the foregoing.

Thus far we have looked at these three systems of side-framing in an abstract manner and without much reference to their actual performances. We have, however, in discussing model Fig. 1, referred to the fact that railroad companies which

formerly used that method had departed from it and followed the forms shown in the models Figs. 2 and 3, and we consider this the most convenient way of showing that the framing shown in model Fig. 1 is not well adapted to cars of modern capacity, as every one who has had any extended experience knows to be a fact. Styles shown in models Figs. 2 and 3 have not yet been in use long enough and in a sufficient number of cars to warrant our drawing any positive conclusions from their service. We have therefore nothing further to add to the foregoing reasons why these two styles are not likely to fulfill the wants of railroads in general.

The committee finds an almost entirely uniform practice in underframe and the end framing with the exception of some variation in depth of truss to underframe, which we think is better to be made deeper than the average practice, otherwise we have no comments to make in regard to the underframe of freight cars, except to call attention to the advantage of the use of iron body bolsters. Inasmuch, however, as there is a larger committee appointed to report in detail upon the standard 60,000 pound box-car, your committee refrains from making any explicit recommendations at this time, as we see no reason for any difference in the general style and plan of framing for 60,000, 50,000 and 40,000 pound cars, but only for changes in detail of sizes for cars of different capacities.

All of which is respectfully submitted.

JOHN W. CLOUD,
R. H. SOULE,
L. PACKARD,
} *Committee.*

MR. DAVENPORT—The model, No. 3, has one quality that seems to me entitles it to a good deal of consideration. You will notice that in case of the settling of the car, the tightening up of those tie-rods will put the camber in as originally, and without disturbing any of the framing. I have seen cars of that construction that have been running a number of years, and have seen them put up as the camber was originally, with a monkey wrench on the under side, without disturbing anything. That seems to me an important point in favor of the No. 3 style of framing. That cannot be done in any way that I know of with either No. 1 or No. 2. If you draw up the tie-rods of No. 2 you loosen the braces. They act against each other, not in conjunction. No. 3 is a simple style of framing. In it the well-known bridge principle has been adopted, which all engineers understand, and which has proved, I think, successful in all the years of its existense; and therefore it seems to me that that is an important point in favor of No. 3.

MR. CLOUD—Will Mr. Davenport be kind enough to name what bridge-truss he refers to.

MR. DAVENPORT—The Howe.

MR. CLOUD—This (indicating) is model No. 8. Do you call that a Howe truss?

MR. DAVENPORT—Well, it is the Howe truss principle.

THE PRESIDENT—Mr. Kirby, some time since, was about to speak on this subject. We should be pleased to hear from him now.

MR. KIRBY—I do not know, Mr. Chairman, that I have very much to say about that. If I should give an opinion as to the framing of No. 1, I should add another diagonal rod in that other panel, next to the door-opening; and then, instead of any bolster-iron being all one piece, I should cut it in two. If that is eight inches wide, I should make two four-inch bars, and spread them perhaps two feet apart, supporting the end of the car against the continual tendency to break off at the body-bolster. That would support it and make a better foundation.

MR. WILDER—In regard to the question of body-bolster, the experience we have had with foreign cars running over our line with body-bolsters is that the bolsters are usually made altogether too narrow. I think Mr. Kirby's suggestion in regard to that matter—if we are going to use an iron body-bolster, to make it in two pieces welded together with lateral connections, and making it wide apart is a good one. I have also found that in almost every instance where I have examined cars with iron body-bolsters, the bolsters were loose on the frame, there being a difficulty in keeping the nuts tight on them. In narrow bolsters they have been started from the shocks received by suddenly stopping the car, and the action of the brake; and the plan suggested by Mr. Kirby certainly would give greater stability to the bolster and also help to support the end of the car as he says.

MR. CLOUD—I will call attention more particularly to the fact that there are three cars here sent by the 60,000 pounds Committee, and I will say that personally I think that the proper framing is shown on those cars, and I think that the other members of the committee, who made this report, perhaps think very much the same way. It seems to me that with the loads we are carrying now and the heavy trains that we have, it is very necessary that the panel should be braced in both directions. Now you may not be aware that one of the cars the 60,000 pounds Committee sent here has a full-fledged Howe truss. The other two cars have Pratt trusses. They have double diagonal tie rods on a vertical brace. This is what might be called a half-Howe truss. It is somewhat of a mongrel because it has the vertical brace here as well, but it needs the other brace, in my judgment, because it is subjected to these heavy shocks of buffing. I do not mean the pulling of the engine, but the buffing, which is much more severe. That being so, and the endwise pressure of the car, and especially the inertia of a second deck of stock—if they have, for instance, an upper deck loaded with sheep or hogs—its weight has considerable leverage on this point, and when you hit that car heavily its whole weight tends to go forward—to continue on its motion. In other words, the end frame is knocked out from under it. It seems to me that all these forms will allow this distortion to the most marked degree, perhaps in a double-decked car-load of stock, and the only way properly to protect it from this distortion is to make each panel of

itself a stiff panel. That may be done in two ways, by making a full Howe truss or a full Pratt truss. Personally I prefer the Howe truss, the braces, perhaps preferably, to run by one another, and be secured at the point of intersection. We have been working that matter up for the past year and a half. We considered that the Howe truss was better than the Pratt, but we used the old thickness of braces and put the counterbrace in against the shoe, fastened on the main brace without cutting the main brace. That car went into service and has been in service for eight months, and has stood very well.

But we have now improved on those plans and have used wider braces, and let them pass by one another, and constructed a car on that principle. It has not been in service long, but is very much preferred to the first style. In constructing a car as we have it now the plates and the side sills are drilled to a templet. The braces and counterbraces are all cut off in the mill. There is no boring diagonal holes, and there is no doubt of its coming up tight.

MR. WILDER—The question is whether the ends of the counterbraces in the frame there are absolutely necessary. Mr. Cloud spoke of a car running eight months and showing very good service. We will have to wait some years before we know the benefit of putting any additional weight on the braces.

MR. KIRBY—In 1876 I received an order from our officers to build fifteen lumber cars. They were, however, built just like some then in use on the Flint & Pere Marquette Road, running on the lumber line between Saginaw and Cincinnati. The cars are 33 feet and 10 inches long inside. I built them just about like this car (indicating), with the exception that I put another diagonal rod in there. The post was 5 inches thick, and all the other timber 4½ inches thick. The end posts were the same size, 2½ thick and 4½ to 4⅝ inches wide. I ran a lip up inside, and bolted that lip to the end plate. That prevents any shifting of the lumber from forcing the end of the car up. I did not use any more timber. I turned them the other way, and used my timber at the best advantage. I had no long rods like that, because I don't like them when you have a construction of that kind. The engineer who would build a bridge where he had fourteen or fifteen feet of vertical framing, would not be considered a good engineer if he put truss rods underneath. It is eight years ago this fall since those cars were built, and they are running to-day. Experience teaches me that that kind of framing will hold up almost any weight you put in a car, if one has enough vertical stiffness to keep it straight.

MR. GORE—Are those cars used exclusively for hauling lumber?

MR. CLOUD—No, sir; they were used for anything we have to put into them. They were not built for carrying twenty tons, but they are carrying twenty tons as often as they carry ten tons.

MR. KIRBY—There is one thing I omitted to mention, and that is the getting in of those braces. Very many people, perhaps most people would consider that those two diagonal braces to the left of the post over the body-bolster should be both of one length, and that is where the mistake comes in. For you observe the diagonal brace next to the vertical post, standing directly over the body bolster should be a little longer than the other one. You start with a positive point at the body-bolster and commence your camber, and in the next one the camber of your sill and your plate are equal. If that is not observed, there is a point which is the first point to start from—that is the panel that carries

the next one, and if you let that down, the next one goes down, and if you hold that, it is just like an abutment, you can carry the next one.

MR. BISSELL—There is one point that has been spoken of, and that is in regard to the size of the rods in the first and the second panel. In building bridges, we make the rods nearer the pier larger than rods nearer the centre. Should not the same principal be observed in trussing a car ?

MR. KIRBY—Since Mr. Bissell has called my attention to that, I will say that my first rod was ⅞, and my next one ¾.

MR. WALL—I would like to ask Mr. Bissell, as the head of a contract shop, whether it would be practicable to vary the sizes of the braces in a car and make the first rod smaller than the second rods, and make the braces of different lengths as Mr. Kirby has recommended ?

MR. BISSELL—I would say in regard to trussing cars, it would make a difference in the size of the rods ; I would make the first rod here—the one that leads from the transom heavier than this one (indicating), as there is a great deal of strain on the end of the car when the cars are coupled together, owing to the irregularity of the track. Sometimes one car will nearly lift the load, and in the end of the other car it is necessary to have a very strong support from this point to this point.

MR. WILDER—I would ask if the brace running down to the corner of the car does not furnish that support.

MR. BISSELL—It does in one way, and the rod holds it the other way.

MR. WILDER—Which way does the rod hold it ?

MR. BISSELL—The rod holds it both ways.

MR. CLOUD—It seems to be ignored here that the bracing of a car should not be like the bracing of a bridge. A car is subjected to endwise shocks. I want to know what is the use of putting in a brace one way and the tie rod the other, excepting to increase your capacity for carrying a load. For making the house stiff endwise, I do not think that the two are better than one. I think if you want to make the house stiff endwise, you have got to tie each panel.

MR. WILDER—How is the load carried from one end and transferred to the other, it is not carried across the door space ?

MR. CLOUD—If this car is made with a complete truss, so that each side of the car is perfectly stiff of itself, you have got sufficient bridge here to carry the load. All it needs, and all it should have is sufficient bracing there ; sufficient bracing there to support these parts, and the matter of carrying the load that is to be transmitted across that space, that space is such a small span that the end framing is entirely sufficient.

MR. WILDER—Cars have been loaded with ten tons in one end and nothing in the other, and although the car itself properly constructed on the cantilever principle, the truck being the column, and the load on the forward end of the car counterbalancing, the load has to be transmitted both ways across that door space, and if there was a truss in there, it seems to me it would be stronger than if we were not obliged to have the door open.

MR. CLOUD—The upper part of the bracing is to keep the house stiff. The under framing ought to carry the load.

MR. WILDER—We have on our road some cars built twenty-five years ago without any under trussing at all, and which are framed practically the same as those are, and to-day those old cars are there loaded with fifteen tons and standing up well, and they do not show that they have gone down a particle,

which indicates that the side framing trussing of the car is what holds it up, not the full trussing.

THE PRESIDENT—I have been requested to call upon Mr. Hackney to speak on this subject.

MR. HACKNEY—I would rather leave this to more experienced men than I am. I have very little to say on this subject.

MR. WALL—I move that this report be accepted and that the Committee be continued. These two Committees, one on the sixty thousand pounds house-car, and the other on the framing, seem to have been overcome with so much courtesy towards each other that they could not either of them submit anything in a yes or no form. What we want, as I understand it, is a frame that the Committee can say they recommend. Then we can come here and criticise it. In that way we can come to a standard on the house-car. If this thing is to continue year after year, we will never come to a conclusion. We should instruct these Committees to make a report that will meet their views. If they can't agree among themselves, let them report any way. I would therefore move that their report be accepted, that the Committee be continued, and that they be instructed to bring us next year a standard frame.

MR. FORNEY—I will amend Mr. Wall's resolution, by moving that the two Committees be consolidated and that the old Committee be instructed to furnish drawings to be published with the report.

MR. CLOUD—We have especially worded the report so that no drawings are necessary and the persons who understand the subject, and who are the only persons we care about addressing, are able to comprehend it without drawings. I do not think that drawings are necessary at all.

MR. FORNEY—I withdraw that part of my amendment to the motion.

Mr. Wall accepted the withdrawal of that part of the amendment.

Mr. Wall's motion as amended was carried.

MR. MILLER—I would like to call up for reconsideration some matters, which have been passed over but with little discussion. I think with Mr. Wall that we meet here and postpone standards that we might adopt. There is still the matter of standard trucks which has had no discussion whatever to draw out the opinions of members; and the matter of a standard section for a car-wheel. I would move, if I am in order, to reconsider that and bring it up for discussion. I believe that we might as well now adopt a standard as to put it over for another year.

MR. GORE—I think this brake-shoe matter is highly important and that should be settled at this convention, It has gone on year after year, and we are no nearer to getting anything of a standard to-day than when the matter was first talked about. I think it very important that this matter should be decided at this meeting.

MR. MILLER—I would include that in my motion.

THE PRESIDENT—If there is no objection, the question of a standard freight car truck is now before you for discussion, with the report of the committee, which was presented at our session on Tuesday.

MR. MILLER—As chairman of that committee, I want to say that there are several points in the construction of freight car trucks which are important, and whatever committee takes it up should get an expression of the opinion of members before they begin work. Some favor a rigid frame, some a swinging bolster, and some, other forms. There are railroads in the country to-day

which are looking to this discussion with a view of getting some standard truck.

MR. VERBRYCK—We think we have a pretty fair truck on our freight cars; but I will say, for one, that I am ready, if we can agree on a standard truck, which I do not think quite as good as the one I have—in view of the importance of having uniformity, I am ready to take up and commence the building of such a truck as the Association may recommend.

MR. PACKARD—I would like to ask if that committee recommended any special truck as a standard.

MR. VERBRYCK—We all realize in our interchange of cars, how difficul it is to have patterns for all the different kinds of castings. If we do not have patterns, we have to send off perhaps a thousand or fifteen hundred miles for castings, and the cars are out of service for six or twelve months before we get castings. I think this is a matter that ought to be decided before anything else.

MR. MILLER—In answer to Mr. Packard's question, I would say we have not recommended a standard truck. In the first place we have not decided on what the standard capacity shall be. We do not know at what rate of speed these trains must be run. There are several reasons why the committee could not work intelligently on this subject, and for that reason they did not report a standard.

Another thing, the committee as it stood was unanimous that the present truck as used in the country, is not what would be required in the near future.

MR. WILDER—I would ask Mr. Miller if a truck should be adopted as a standard, for say a 60,000-pound car—should we have another truck to meet our present practice. I do not think that the cars of the future in this country are going to have a capacity of 60,000 pounds. There are a great many reasons why they should not have such a capacity, and reasons which cannot be overcome, mechanically at least. I think if we are going to have a 60,000-pound car, the truck to be adopted for that should be entirely different. The size of journals, the weight of wheels and other portions of the truck should be entirely different from our present practice, although I admit that our present practice ought to be amended, and we ought to have a better truck than we now have.

It would be well enough to have these committees agree upon certain parts which should be uniform with others, such as brake-beams and brake connections, etc., so that they would be uniform in those respects.

MR. VERBRYCK—I agree with Mr. Wilder about the 60,000-pound car. I do not think we have come yet to the time when a 60,000-pound car will be needed. We cannot load 60,000 pounds of most of our freight, particularly merchandise and such things, into a car. I think, before we increase the capacity of our cars, we ought to increase the weight of the rails and the strength of the bridges and everything in the permanent way. I do not think that a 60,000-pound car is a necessity at the present time. I think our present car is large enough for the present wants of the country.

MR. KEELER—Probably a truck suitable for a 40,000-pound car would do for a 60,000-pound car, with some minor changes. The pattern would only have to be increased slightly. So far as the castings, oil-boxes, brakes and such things are concerned, I think it advisable at this time to adopt a standard, and railroad managers are all looking for it. They are looking to this Convention to take such a step. They think it is child's play for us putting it off from year to year.

MR. CLOUD—I think that the report on trucks, which was read yesterday, gives certain reasons for abandoning the wooden frame truck. They were not all satisfactory or sufficiently clear to me to convince me that that was the proper course; and I think that in order to get at this matter gradually we had better agree that certain features should be embodied in the trucks without going down in matters of detail, or size, or anything of that sort. I think it would be wise for this Convention to express its opinion one way or the other on the question as to whether freight car trucks should have the ordinary diamond frame which has been in use. The report of the committee was against the continuation to a certain extent of that frame. It seems to me that the ease of repair to that truck and the service it has given and the increased loads that it has carried above what it was designed for, all these matters go to show that it is a decidedly good form of truck. Perhaps many of us here are in favor of swing bolsters, and many are in favor of rigid bolsters. I therefore think that a truck frame should be decided on by a vote and in words not giving sizes, describing the type of truck frame which may be used, with swinging bolster or rigid bolster, with very slight modifications. It is not a matter of very much consequence to say whether anybody uses the swinging bolster or anybody uses the rigid bolster, provided our truck frame is the same. In order to adopt a rigid bolster, it would seem almost necessary to have cross-channel bars. I say channel bars, because I suppose that trucks will be built nearly all of iron. It would seem therefore to be wise to take a vote and get the sense of the Convention on this subject; and I therefore move that it is the sense of this Convention that a standard freight car truck should be of the diamond form. By that I do not necessarily mean that the upper and lower parts of the diamond should be of the same shape at all, but of that type, and that it should have cross-channels so that it may be used with a swinging bolster or rigid bolster.

MR. WILDER—In seconding the motion I would say that I fully agree with Mr. Cloud in regard to the utility of the diamond truck. It has been our standard truck for a number of years, and I think that the ease of repairs, the efficiency of work, and everything about it, mark it as the best type of truck now in use. There are some weaknesses about the frame, as it is now made, particularly stiffness of the upper arm of the truck, which is not strong enough to stand the compressive strains; but that can be very easily remedied by putting in a heavier bar, and the truck will seldom break down if properly made, even under the extreme weights put upon it—even when carrying as high as 40,000 lbs.

There is no question but that a diamond form can be made strong enough. I think that all the members can see that with a rigid centre, constructed of all iron, the truck, if made strong enough, could not be broken down. If a swinging bolster is desired, the truck used by Mr. Keeler, or by the Chicago, Burlington and Quincy, or the Michigan Central, can be increased by increasing the weight of the bars to carry any load you can put on them. The only question with the Committee was, whether that form was desirable or whether any improvement was desirable.

MR. KIRBY—I would like to say a word or two in confirmation of what the gentlemen before me have said. I do not see why we should run off on some new thing we have not tried, and run away from an old thing that has carried us ever since railroads have run. Here is this form of diamond truck loaded with twenty tons frequently, and when they do give out, it is principally the

vertical bolt. Well, it is no trouble to increase that. I cannot see any better thing to adopt than the diamond truck, and increase the parts to carry what we wish it to carry ; and, as the gentleman who spoke before me remarked, those who wish a swing-motion truck, let them put it in, and for myself I cannot see as much value in that as some people do. Take the cars as they have been running for twenty or twenty-five years, with the old form of diamond truck : the wheels last as long in that as they do in the swing-motion, and they are put to just the same kind of service to-day as the new 40,000-lb. cars are. This experience is where I get my information from, for I am no theorist—no scientist. After thirty years' experience I can see no good reason for departing from the diamond form of truck. Only increase the parts, and we all know where the weak parts are in it, and experience has taught us that without going to any book or theory of any kind ; we can get along very well with that truck. I cannot see any reason for departing from the diamond truck and the rigid centre.

MR. MILLER—Mr. Kirby does not see any advantage in a swing bolster. He does not make his passenger cars with a rigid centre, nor does any one else in this country. Now if there is no advantage in it what do they put it in their passenger trucks for ? There are some things to consider about this, whether you are going to increase the blow on the rail or whether you are going to put in some improvement that will lighten it. Those things were considered by the committee.

MR. KIRBY—I did not wish to be misunderstood. Those in favor of the swinging motion truck would use it, but I want it to be distinctly understood that I am not particularly in favor of the swing-motion truck for a freight car.

MR. McKENZIE—In confirmation of what Mr. Kirby has said about the old cars and the new ones, that is the twenty-ton and the ten-ton cars hauling about the same load, I would say that we have about 7,000 cars on our line and they are all 40,000-pound cars. I asked our President the other day if he could tell me what was the average load on our line, and he remarked that it did not exceed seven tons to a car. We may be unfortunate, being a new road and not having much local business, but it seems to me it is unnecessary to go to work to establish an extraordinarily heavy truck to carry seven tons.

MR. DAVENPORT—It is not likely the swing-motion men are going to give up their swing motion ideas, nor the rigid truck men their rigid truck ideas. We might as well then, it seems to me, concede to each his peculiar views and modify, if possible, the arch-bars and those parts of the truck that can be used in either case. Now we have found out through this Association, by experiments, this fact, that the upper member of the diamond truck needs to be strengthened and the lower or centre member has a surplus strength. For instance, when we use an inch arch-bar for the top, we do not need an inch bar for the centre—the inverted bar, perhaps, would be a better term. If we were to take $\frac{1}{8}$ of an inch for the inverted bar and add it to the upper bar, we would not increase the weight of our iron and that would make a 40,000-pound truck sure for the ordinary diamond truck, if we made the upper bar of $1\frac{1}{8} \times 3$. Now if we proportion those parts right I think we can have a twenty or twenty-five ton car without any difficulty. Of course I am not going to say anything against those who want a wider arch-bar ; one inch by three has been the ordinary size. Now if we make the upper bar $1\frac{1}{8} \times 3$ in. and the inverted bar $\frac{7}{8} \times 3$ in. and

the lower bar, if you please, ½ × 3 in. you will have a truck that will do an immense amount of work with a minimum of dead weight and expense.

Mr. Cloud's resolution was read again.

MR. HACKNEY—I should like to find out the sense of the meeting, whether it is for a rigid or swinging bolster.

THE PRESIDENT—That could come up afterwards; it is not involved in this question.

Mr. Cloud's resolution was carried.

THE PRESIDENT—I would ask the Committee on Trucks if they would wish to go any farther on this subject at present?

MR. MILLER—Is not Mr. Hackney's motion in order now?

THE PRESIDENT—There is no motion made by Mr. Hackney. If he will make a motion it will be heard before the house.

MR. HACKNEY—I will make a motion that the sense of the meeting be taken as to whether a rigid or swinging bolster is preferred.

The vote was first taken on the swinging bolster. After the vote was taken the President said he was in doubt.

MR. WALL—I will ask if that is going out to the country as the sense of the Master Car-Builders' Association whether they are in favor of the swinging or rigid truck? If the country wants to know that, we should vote on the cars. If the country wants to know what is our preference on that matter, I think the roll should be called, and we ought to vote according to our representation.

MR. FORNEY—I will say to Mr. Wall that the members may perhaps be involved in trouble in this matter; because it is a question now whether this motion should be submitted to letter ballot or not. Probably the idea was that this was just a preliminary action to see what the sense of the Association was.

MR. CLOUD—As I made that motion, I will say that Mr. Forney is about correct in regard to the animus of the motion, and that I had still further objects in view, which is that before this Convention meets next June the Pennsylvania Railroad will have to build some trucks of greater capacity for heavy cars, and we want to know what the general opinion is here. I was very glad that the subject was brought up again to-day, for the reason that we want to know the opinions of the representatives of the roads who are present here. We have got one definite indication, and I hope we can get some more in other matters. I do not think it is at all necessary to go before the Association with a letter ballot. It is not a standard; it is test of the sense of the Convention with a view of giving instruction to the brake committee.

THE PRESIDENT—This vote was taken merely to get the sense of the meeting.

MR. WILDER—The important point to be considered in this matter of trucks is more in the detail of the truck than in the general form. All those matters that are necessary to be replaced in repairs are the ones that give us the most annoyance, and those are the things that I desire the Master Car-Builders' Association to decide upon before any other.

MR. DAVENPORT—It is asked by a member whether the action just taken, recommending the diamond truck with the channel bar would infringe on any patent existing—whether it may not be that we are adopting something or recommending something that is a little beyond what we intended. Now, I do not know but that some of our members voted without a clear understand-

ing of this matter. I very much question whether every one may have understood whether or no there was a patent that might be infringed, unless they settled with the owner first before they could use a channel bar in the way proposed.

THE PRESIDENT—In order to set that matter of the vote on Mr. Hackney's motion at rest, I would ask those in favor of a swing bolster to rise.

Thirty-two rose.

THE PRESIDENT—Those opposed to the swing bolster will please rise.

Thirty-one rose.

The announcement of this vote was received with applause.

MR. KIRBY—I would like the President to change the wording of the motion. Very many rose on that last question who were not opposed to the swing motion, yet they would not recommend it as a standard truck for freight cars.

THE PRESIDENT—I put the question, as I understood it, in order to get the sense of the meeting.

The Secretary then read some invitations to visit places of interest, which, on motion of Mr. Wilder, were accepted with thanks.

MR. CLOUD—I think that this matter of trucks can be carried a little further to-day. The Committee recommended a certain definite distance for the wheel-base, and it would be a proper thing for us either to agree on their recommendation, or to disagree and let them try again. Give them instructions at least as to that, and as they will probably come before us at the next meeting with drawings, it will be of a great deal of use for them to know what the opinion here is as to what the wheel-base should be, and, therefore, I would move that the five feet wheel-base proposed by the Committee be considered as a satisfactory suggestion; in other words, that it is the sense of this meeting that a five feet wheel-base would be accepted.

MR. KEELER—I move as an amendment that we adopt the recommendation of the Committee as a standard.

The Secretary, at the request of the President, read article 9 of the Constitution on the recommendation of standards.

The President said that the question was on Mr. Cloud's original motion.

That motion was carried.

MR. MILLER—The Committee, whoever they may be, have something tangible to work from. We have doubts whether there are as many members in favor of the rigid centre as there are in favor of the swinging bolster.

THE PRESIDENT—Gentlemen, it has been suggested that it might be advisable to adjourn to see the trial of automatic couplers, which is to take place at 12 o'clock in the passenger yard of the depot of the Delaware & Hudson Canal Company.

MR. WILDER—If we adjourn to see that, as perhaps we had better do, it will certainly take us another day to finish our business here. I therefore move that we now adjourn until 9 o'clock to-morrow morning.

MR. FORNEY—I would like to amend Mr. Wilder's motion by suggesting that we definitely decide whether we remain over another day.

MR. WALL—I am opposed to adjourning the meeting now to see that trial. Most of us have seen those draw-bars. To-morrow we shall have difficulty in getting the members together. We have difficulty every morning in getting them together. We will have the same difficulty to-morrow,

even with those few that do remain. We have a good body here now and we might as well go on with our regular business and adjourn at the regular time. This trial I understand is before some of the State Commissioners and some transportation officers, who are interested in seeing it and who, probably, would not want to see us around. Only a few people can see a trial any way.

MR. WILDER—I will ask the chairman if it be possible for us to get through our business to-day if we should keep a continuous session or have an afternoon session.

THE PRESIDENT—I do not think it would be possible to get through to-day if we adjourn now; but I would suggest that it would be showing courtesy to the Commissioner who has been with us this morning if a party of not less than three or five were detailed to go down to see this trial with whom he could consult and talk with on this subject of couplers, and that would prevent the necessity of an adjournment.

MR. WILDER—I withdraw my motion to adjourn and move that a committee of five members be appointed to accompany the Commissioner to see the trial, including the car coupler committee.

The motion was carried.

THE PRESIDENT—As the Chairman of the Committee on Draw-bars, is present, I would ask him to suggest whom he would like to accompany the Committee at this trial.

MR. MARDEN—I have no suggestions to make. The Committee on Draw-bars has been witnessing tests for the past twenty-four hours and is getting tired of it. We were given to understand in our committee room that the convention was to adjourn, and the Commissioner so understood it. But it is immaterial to us. We should like to have Mr. Garey with us.

MR. MILLER—I move that Mr. Garey be excused in order that he may be able to attend the exhibition.

Agreed to.

MR. MARDEN—I suggest Mr. Wilder.

MR. McKENZIE—I move that Mr. Wilder be excused.

The gentlemen named withdrew in order to witness the test of draw-bars.

MR. CLOUD took the chair and said:

Do you wish to take any further action in regard to trucks?

MR. MILLER—As I understand the matter now, Mr. Chairman, the Committee was discharged.

The report of the Committee to whom the subject of placing a trap-door in roofs of passenger cars was then read.

REPORT OF COMMITTEE TO WHOM A COMMUNICATION FROM THE RAILROAD COMMISSIONERS OF THE STATE OF NEW YORK, RELATING TO THE PRACTICABILITY OF PLACING TRAP-DOORS IN THE ROOFS OF PASSENGER-CARS WAS REFERRED.

Your Committee to whom was referred the subject of placing trap-doors in the roofs of passenger cars respectfully report that it is advisable and they recommend that hereafter all passenger cars be so constructed as to have an opening in the roof with a cover which can be removed in cases of accidents that may require some means of escape for the passengers.

JOHN MACKENZIE,
SANFORD KEELER, } *Committee.*

THE CHAIRMAN—It seems as though we ought to do something about this matter of trap-doors that has been referred to us. However, if you do not wish to discuss the matter, I will put the motion.

MR. LENTZ—I think this report should receive the attention of the Convention. I would move that this Committee be continued and that they be requested to present at the next annual Convention plans of what they would recommend.

THE CHAIRMAN—That motion cannot take precedence of the other.

MR. C. E. GAREY—I withdraw my motion to lay on the table.

MR. McKENZIE—The committee did not have time to act on this matter and in view of the fact that the Railroad Commissioners of the State had sent a communication to the organization, we thought it best to express our opinion in that way so that we could get the opinion of the members of the organization, and I think that it is a worthy object and ought to have the attention of the members.

MR. LENTZ—I now renew my motion, that the committee be continued and that they be requested to furnish plans at the next annual convention.

The motion was carried.

MR. LAUDER—I wanted to oppose that motion put in that way. I don't believe that this Association and the car-builders of this country want to chop into the roofs of their cars and put in a trap-door. This Association has raised a Committee to bring forward plans for doing this thing. I think the Committee better take the matter into consideration, and ascertain whether it is desirable to put a trap-door in the roof.

THE SECRETARY—They have done so.

MR. LAUDER—I did not know that.

MR. WALL—As I understand, the records will show that this communication was received, the Committee appointed, and they reported favorably, and the Committee was continued over until next June, with instructions to submit drawings and specifications. That does not commit us to putting these doors on until we have received this report.

THE CHAIRMAN—Your understanding is correct.

MR. PACKARD—I move that the Committee on Trucks be continued, and that they present to the Convention, in another year, what they would recommend as a standard truck for 40,000 pounds capacity.

Seconded.

MR. McILWAIN—I would like to amend that motion by adding two more members.

The amendment was seconded.

THE SECRETARY—Before this resolution is put it seems to me we are in a little danger of becoming confused. There is some action taken instructing this Committee to do certain things. Now, Mr. Packard makes a motion instructing them to do certain other things. I think the instructions should be to present a plan for a truck in accordance with the instructions to-day.

MR. VERBRYCK—I am opposed to increasing that Committee for the very reason that these gentlemen who have been on it are familiar with the subject; and you add new members to it and it will take a year or two before we get anything that is likely to be adopted; and I think the Committee as they were constituted are amply able without any help to get up plans.

MR. PACKARD—When I made that motion, it was expected that they would, in mentioning their plans, make them in accordance with the suggestions made by this convention.

THE CHAIRMAN—Mr. Packard had better include that in his motion.

MR. PACKARD—I include that in my motion.

THE CHAIRMAN—It has been moved and seconded that this Committee be continued with two additional members, to present at the next meeting a plan for a truck, embodying the suggestions made this morning as the sense of the meeting.

The motion was carried.

MR. DAVENPORT—A question was asked in regard to whether this convention had a clear understanding of the matter of the channel-bars in the diamond truck. Now, will the Secretary please read the resolution that was adopted here on that matter, that there may be a clear understanding as to what action was taken.

The Secretary read the resolution.

MR. WALL—There is one point before we altogether leave the subject of trucks that ought to be considered; we might give the Committee some instructions with regard to the size of the axle. That has been up several times, and it might be well to ascertain the sense of this meeting as to whether our axle should be increased, and if so, to have among the committees we appoint next year a committee on an axle, the size of journal bearings, and the Committee on Trucks should then incorporate the recommendations of the committee on journal bearings in their report. I therefore make this motion to ascertain the sense of the meeting as to whether the car-builders think the size of the master car-builders' journal bearing should be increased for cars of 60,000 pounds capacity—instead of 60.000 pounds I will say for all cars over 40,000 pounds capacity.

MR. BISSELL—I second the motion.

MR. WALL—There is another point I would like to make, Mr. President, and that is that Mr. Bissell and myself are on the Committee on Subjects for the next year, and we want to know, of course, what subjects would be especially interesting, so that we should avoid making some of the errors that were made last year.

THE CHAIRMAN—I think this committee of five are competent to take care of the whole subject of trucks.

MR. KIRBY—Mr. Wall referred to dimensions of the master car-builders' standard axle. I think the journal and the wheel fit perhaps is large enough for a 40,000 pound car, but the centre is too small. I think that the centre should not be less than 4¼ inches in diameter. Now, if you want to increase your car to 60,000 pounds you would want to increase the dimensions perhaps in proportion; that would be very easy to arrive at, provided we took our present standard by increasing the centre and working from that.

MR. HOVEY—I agree in the estimates made by Mr. Kirby in relation to the axle. We find our axles under our 40,000 pound cars too light in the centres, and I would suggest, for a heavily loaded car, that it be not less than 4¼ inches in the centre, which is quite small enough for that weight of car.

MR. PACKARD—I will state for the information of those gentlemen last up that the centre of the axle is not interchangeable with any part, and they can readily increase that if they find it is too weak, as we do now. On the New York Central the axles are 4¼ inches in diameter.

MR. BISSELL—This is no reflection on the ability of the committee whatever. This expression is simply to give the experience of the members of this Association, and that is the way they get their information. We have changed to buying all our axles 4¼ in the centre for passenger service, and the reason was that we were called upon to do that where we used 42 inch wheels; though by getting our axles for passenger car service of a size we could use the same axle But as it requires a 4¼ inch axle for a 42 inch wheel the increased tonnage that is placed on a freight car would make the same necessary.

THE CHAIRMAN—The motion before the house is on the journal only; the members will please confine their remarks to that.

MR. C. E. GAREY—I understand the motion of Mr. Wall to be whether the size of the journal should be changed for cars carrying more than 40,000 pounds, while our committee are instructed, as I understand, to prepare a truck for a 40,000 pound car. I don't see that this discussion has any relevancy at all to the instruction of the committee.

MR. WALL—I don't understand as Mr. Garey does that the committee were instructed to prepare a truck for a 40,000 pound car. I don't understand that the capacity has been limited in any way. The whole object of my motion at the present time is to give the committee additional information as to what the Convention wants. We have given that information in reference to the diamond shape and the use of channel bars, etc. Now, do we want to give them additional information with regard to the axle. I just want to bring out the sense of the meeting in reference to that point.

MR. BISSELL—There is one point suggests itself, namely, the desirability of hanging the brakes to the body of the car.

THE CHAIRMAN—That does not come under this motion. The question is as to whether the car-builders' journal is considered large enough to support cars over 40,000 pounds capacity.

The motion was carried.

MR. BISSELL—With regard to the hanging of brakes I consider it a very important point in regard to the truck.

MR. FORNEY—Before Mr. Bissell goes on I will say that there is some

doubt in the mind of the reporter as to whether the motion means that the journal is large enough for a 40,000 pound car.

A motion to reconsider the last motion was made and carried.

THE CHAIRMAN—Will Mr. Wall state his motion now; I want to get the sense of the meeting as to whether the present size of the journal of the master car-builders' axle, is sufficient for cars over 40,000 pounds capacity.

MR. TOWNSEND—We are carrying from twenty to thirty-two tons on our cars, and we are using the master car-builders' standard journal. I think Mr. Wall should put some limit on that. Certainly no one thinks the master car-builders' standard is large enough to carry 100,000 pounds.

MR. WALL—From 40 to 60,000 pounds.

THE CHAIRMAN—The proper course for members to take then, is to vote no.

The motion was lost.

THE SECRETARY—I move that it is the sense of this Association, that the master car-builders' journal is large enough for cars whose capacity does not exceed 40,000 pounds.

MR. RHODES—I have no doubt it is large enough, inasmuch as the Association made that their maximum size. We must make it so large that when the journal wears a little it will still be large enough to carry the weight of the car. I think it is very important that the Association should make a limit, a maximum and a minimum size. When I go over the road I find journals that are much too small for freight cars.

MR. DAVENPORT—Will the Chairman be kind enough to inform us what size of journal is used on the 60,000 pound cars of the Pennsylvania Railroad.

THE CHAIRMAN—The Pennsylvania Railroad has no 60,000 pound cars.

MR. DAVENPORT—Then 50,000 pound cars.

THE CHAIRMAN—8½ by 7 inches.

MR. DAVENPORT—Could the Chairman inform the Association whether there has been any trouble from the extra heating of bearings under the 50,000 pound cars.

THE CHAIRMAN—No, sir; he has no definite information on that subject.

MR. McKENZIE—We all understand, Mr. President, that this is for the four axles under the 40,000 pound car.

THE SECRETARY—Of course that was the understanding.

THE CHAIRMAN—The question is whether it is the sense of this meeting that the master car-builders' journal is large enough for cars of 40,000 pounds capacity.

A *viva voce* vote being taken the question appeared to be decided in the affirmative.

MR. FORNEY—I call for a rising vote.

A rising vote being taken, 36 voted yes. There were no negative votes.

MR. FORNEY—I will now move that it is the sense of this meeting that the centre of the car-builders' axle is large enough for a car not exceeding 40,000 pounds in capacity.

MR. HOVEY—In my judgment for a 40,000 pounds car, I would not make it less than 4⅛ inches. I think that is sufficiently light to sustain the weight. We find that when a car is loaded to its capacity of 40,000 pounds, by placing

the wheel tram on the flanges, that it varies between the track and the top of the wheel nearly 1/8 of an inch. I would suggest 4 1/4.

MR. MILLER—I favor his recommendation, but not the form of standard master car-builders' axle, as I understand it. From the wheel seat towards the centre, as it is now adopted, it is run down almost straight, so that from the wheel seat to the centre it is nearly the same size. I would make the axle so that it would have a straight taper from the wheel seat to the centre, and make it 4 1/4.

MR. HOVEY—Nearly all axles in cars built by the master car-builders are tapered from the wheel seat down to the centre; but in cars built by contract they are pretty sure to take the advantage, and have it nearly straight from the wheel seat to the centre, unless it is otherwise ordered by the master car-builder.

A *viva voce* vote being taken, the question was apparently decided in the negative.

Mr. Forney called for a rising vote.

None voted yes, and 84 voted no.

MR. FORNEY—I now move that the question whether a change should be made in the size of the master car-builders' standard axle from 3 7/8 to 4 1/4 on the centre, and making it a straight line from the centre to the wheel seat be submitted to this Association by letter ballot.

The motion was seconded.

MR. MILLER—I think that ought to be modified a little perhaps, because there ought to be a little space, instead of running the straight taper exactly to the centre. You could hardly do that in hammering the axle.

MR. FORNEY—With the permission of the seconder of this motion I will withdraw the latter part of this motion in regard to the taper.

MR. DAVENPORT—The master car-builders' axle at that point (indicating) is specified to be 4 3/8; and when you come to make up the centre 4 1/4 inches you will discover that you have virtually a straight axle from this point to these two points (indicating), the variation being only 1/8 inch.

THE CHAIRMAN—I think that the Committee will have perfect freedom now to make the taper as they see fit.

MR. MILLER—I think the ground has all been gone over and it does provide for a straight taper from the wheel-fit to the centre.

MR. FORNEY—I think Mr. Davenport is right. There is in the dimensions just given in the standard axle a specific dimension, 4 3/8 inches, in what I would call the "neck" of the axle. If we make that 4 1/4 in the centre it would be almost straight. I think the thing to do would be to abolish that 4 3/8 inches.

MR. WOOD—The point is not located anywhere. You can put the 4 3/8 where you please.

MR. FORNEY—I move that the 4 3/8 in. be omitted by the Committee from the axle which it proposes for the new standard freight truck.

The motion was carried.

MR. DAVENPORT—Now, we have eliminated that 4 3/8, but we have not said anything as to what the idea is as to the shape of the axle. Do you propose to leave that to the Committee?

MR. FORNEY—We propose to say nothing about it.

THE CHAIRMAN—If Mr. Davenport wishes to make any suggestion as to that, the proper way to do is to put it in shape of a motion.

MR. HOVEY—Mr. Forney's first resolution was correct. 4 1/4 inches in the

centre tapering from the wheel seat to the centre. Now, could not that resolution be amended so as to include that taper from the wheel seat to the centre.

MR. FORNEY—The resolution could be amended, but there is very good reason for believing that it would be defeated if submitted in that form.

MR. DAVENPORT—Then what would be the form that would be understood? Now, the gentleman at my right suggests that you do not run the taper from the wheel seat. You leave a shoulder there of an inch and a half before you begin the taper. There would then be a good deal of skinning in your axle if it was left in that form. Some of us know what it is to suffer from a computation that will allow too much skinning; I would like to have it pretty definitely fixed and I would like to have Mr. Blackwell state his view on this matter. His view is that every three inches along that axle the diameter should be specified so as to stop the skinning business.

MR. BLACKWELL—Perhaps the three inches might be changed to four inches or some multiple of the total length; but I think it very important that the wheel fit should extend some distance from the hub of the wheel, and I especially should be very anxious to have it run as far as an inch and a-half, as on the Norfolk & Western Road (which is a five-foot gauge). We are turning that fit an inch and a-half further on the axle, so as to enable us when the day comes for changing our road to the standard gauge, or 4 foot 9, we can close those wheels on the axle without any more tool work. I would suggest that an inch and a-half on either side of the hub be the point fixed, and that between that point and the centre certain even distances be taken, and the diameter be specified. That should be embodied, I should say, in the circular.

MR. MILLER—I don't understand. My motion certainly was that the surface should be straight from the wheel fit to the centre; and how it could be understood any other way I don't know.

MR. BLACKWELL—As the figure I mention, 1½, would conflict with the master car-builders, I would be quite willing to withdraw that suggestion and not make any difference in the longitudinal dimensions as now figured on the standard.

MR. MILLER—I move that the form of the axle be left discretionary with the Secretary and let him submit that with the letter ballot giving a diagram of it.

Seconded.

Mr. Miller's motion was carried.

MR. FORNEY—It seems to me that it would be a very proper matter here to take some action in regard to the journal bearing and the journal box, and to give this committee an idea of the sense of the meeting as to whether they should adopt the journal bearing and the journal box of the Master Car-Builders' Association. I move that the Committee be instructed to use the master car-builders' standard journal bearing and journal box in the trucks used for cars not exceeding 40,000 pounds capacity.

MR. MILLER—I do not understand that the Committee is instructed to report about a car of a capacity over twenty tons, and in that event I think they would not interfere with established standards.

THE CHAIRMAN—It is moved and seconded that the Committee be instructed to use the master car-builders' journal box and bearing for cars not exceeding 40,000 pounds capacity.

The motion was carried.

MR. WALL—I want to put a motion as to whether it is the sense of this meeting that a committee should be appointed next on a standard axle for a car of over 40,000 pounds capacity.

THE CHAIRMAN—The motion is out of order. Let the Committee on Subjects suggest what it pleases and we will consider it when it comes up.

MR. WALL—The question of hanging of the brake on this kind of truck has not been alluded to, and to bring out a discussion on this question I offer a motion, that it is the sense of the meeting that the committee be instructed to embody in this standard car an arrangement of brakes from the cross-pieces from between the wheels.

Seconded.

MR. DAVENPORT—What does this mean? Some of the gentlemen don't understand that this Committee are compelled to submit a plan with channel bars; it is not left optional with them at all. They are compelled to submit a plan of a rigid truck with channel bars.

24 voted for Mr. Wall's motion and 7 against it and it was declared carried.

THE CHAIRMAN—The committee will act accordingly. I don't see how they could do otherwise, since they have been instructed to use the diamond truck and there is no other way of hanging the brakes on that truck.

The report of the Committee on Automatic Freight Car Brakes was read.

REPORT OF COMMITTEE ON AUTOMATIC FREIGHT CAR BRAKES.

Your Committee on Automatic Freight Car Brakes respectfully submit the following report:

A series of questions bearing on this subject was circulated by the Secretary among the members of the Association, from whom 18 replies were received. Four of these were to the effect that an automatic brake on freight cars was a necessity; while the balance expressed the opinion that an automatic brake was not absolutely required, although its introduction would be desirable.

The advantages to be derived from the use of automatic brakes on freight cars appear very great, but it is possible that they may be counterbalanced by serious disadvantages; for, were all freight cars equipped with an automatic brake, the failures peculiar to this particular brake would be, doubtless, encountered to a very much greater extent, and, at least, in the ratio that the number of cars in a freight train exceeds that of a passenger train.

The additional cost of application and maintenance of automatic brakes and their incidental failures might not be objected to if applied to special cars on roads where trains composed entirely of such cars could be run. Under these circumstances the automatic brake could be operated with greater success than if generally adopted.

R. C. McCARTY,
CHARLES BLACKWELL, } *Committee.*

On motion the report was received.

MR. McILWAIN—I don't think railroad companies are ready yet to take up that question. I don't think *the* automatic freight car brake has come before us yet.

MR. FORNEY—It seems to me it is very desirable that we should have a more full report on this subject. I was informed yesterday by Mr. Herman Westinghouse, that there will very soon be 30,000 freight cars equipped with the Westinghouse automatic brakes on roads in this country. I move that the committee be discharged and a new committee appointed.

Agreed to.

MR. C. E. GAREY—We have two automatic freight car brakes on our road and have had them for several years. One is the Reed brake, the other is the Tallman brake I am free to say that both of them are doing very well. Still I may agree with the gentleman behind me (Mr. McIlwain) that there may be a better brake yet; and there are other brakes in operation which perhaps some other members can tell us something about.

MR. HACKNEY—We have only just commenced putting those brakes on. We have about 800 on. But we have not yet applied them on a train. We are putting them on at the rate of 25 a day on our entire freight equipment.

MR. BISSELL—Is anybody here from the Central Pacific road? I understand that the automatic brakes are largely used on that line.

MR. HACKNEY—I would say this: I know that on the Denver & Rio Grande they have been running Westinghouse automatic brakes for years. They have found them a perfect success.

MR. RHODES—The Chicago, Burlington & Quincy road have fitted up 50 box-cars with an automatic brake merely as an experiment—Westinghouse automatic brake. We recently made a trip to Denver with a special freight train. One of the questions we wanted to decide was, how it would operate on a train of 25 cars, and we found that the brake worked very satisfactorily on a train of that length.

MR. MILLER—I would like to know if Mr. Rhodes used the ordinary coupling?

MR. RHODES—We used the Potter draw-bar. It was suggested that we should use some automatic coupling, but we did not want to do that. We wanted to try the brake with what we had in use. It was very successful.

MR. FORNEY—I will ask Mr Rhodes whether they have experienced any great difficulty from the failure of the brake and the delaying of trains from that cause.

MR. RHODES—We have had some trouble, but we find when we get down to it that the trouble is not in the brake at all; it is in the ignorance about the brake. Recently, since we have been going into it, we find that by educating our men up to the use of the brake we get very much better results.

MR. FORNEY—It may be inferred then that the men require improvement more than the brake.

MR. BISSELL—I will inquire if there are any others here who are using the Westinghouse brake.

MR. CLOUD—I might say on behalf of the Pennsylvania Railroad that we have had seventy-five cars running with the Westinghouse automatic freight car brake for a year and a half or two years. They have been running a good deal in trains together. We have run fifty cars over the mountain without any

difficulty whatever. I have been on those trains frequently myself to see how they work; but it does not work as smoothly of course on fifty cars as is desirable. We have no difficulty at all in running it on twenty-five or thirty cars with the ordinary link and pin coupling. We find by the substitution of the automatic coupler which did not allow much slack between cars, that the length of train which could be run by this brake without two severe jarring of the rear end was increased somewhat.

MR. C. E. GAREY—Are there not some other forms of automatic brake that have not been mentioned.

MR. MILLER—We had a little experience with the Tallman brake on twenty cars, and we find it is not satisfactory without the use of a driver brake on the engine.

MR. CLOUD—I will call attention to some points in this question for the reason that I have given a good deal of attention to the matter of brakes for some years past. We have experimented with a number of brakes and found that buffer brakes, as a class, soon reach their limit of usefulness. The majority of breaks offered to-day may, I think, be called buffer brakes. They apply the brake by compression of the draft-spring and many of them have no intermediate winding mechanism and therefore reach the limit of power very soon. There are others, however, which have an intermediate winding mechanism which is thrown into operation by the compression of the draft-spring, which can be made to apply the brake. But in all those which are strictly buffer brakes, without the winding mechanism, the compression of the draft-spring seems to limit the usefulness of the brake. But, as you all know, the usefulness of the brake is very much affected by the slack of the brakes. This class of brakes applies the brakes strongest to the cars next to the engine, because *there* is the greatest compression, and back at the rear end it is usually very nearly nothing, because the rear car does not run up against the train with sufficient impetus to press the spring enough to produce any material action of the brake. We have tried this experimentally. We have recently tried a brake which has come out called the Rote brake. We tried it on a car that has been going around the country, and it was a very simple matter to see what the maximum power of that brake was, because all we had to do was to take the spring out which they have rigged in the brake-chain. We took that spring out and tested it to see how much it required to press it $\frac{1}{8}$ of an inch, and then in our trials we put that car next to the engine and held back all we could with the air-brake and noted the compression of the spring, and we thereby got a comparison of the maximum power of the brake. But it would be wrong to conclude that you could get that power all through the train. That is the maximum, and it would probably be zero at the end of the train. Therefore half of the maximum would be the average. Therefore buffer brakes can simply help to stop a train under favorable circumstances, and when the emergency comes they are no use unless you have some one to work them. If you suddenly come upon a signal to stop, the brakes are not capable of utilizing more than a small fraction of the total breaking power that can be used on that train without sliding the wheels. Therefore their efficiency is very low, as a class, and it is a very serious question in my mind whether a railroad company is warranted in expending the amount of money which would have to be expended to put those brakes on a large number of cars for the degree

of breaking power they get as a return. We do not think that any brakes of that class have yet been offered that would warrant the expenditure required. It seems to me that the successful freight-car brake ought to be even more of a brake than the brake used on the passenger cars. It is required to do braking on cars which weigh 20,000 pounds or which weigh 60,000 pounds, that is empty or loaded, and the braking force which can be exerted with safety on the wheels when a car is loaded with three times what can be exerted with safety to the wheels when the car is empty. I believe it is not too much to expect that we may be able to avail ourselves of this additional power. I do not say you can go into the market to-day and do it; but we may possibly get some such brake. I am not willing quite to agree that the time has not come when we can have a freight-car brake, but the question is whether we can get it. I merely wanted to call attention in this way to buffer brakes and to our experience with them.

MR. PACKARD—When I was on the Baltimore and Ohio Railroad I had some experience with buffer brakes. The conditions were of the most favorable character, and our experiments at that time proved unfavorable. They were continued for nearly four years, and the brakes were taken off.

A GENTLEMAN—I would like to know if any of the members present have had experience with the Ames brake. The narrow gauge roads up our way are using it, and they claim it is successful.

MR. WALL—I would like to submit for letter-ballot the following motion, that it is the sense of the Master Car-Builders' Association that the Westinghouse automatic freight brake better fulfills the conditions of a satisfactory freight car automatic brake than any of the other forms that have thus far been submitted to its consideration.

THE SECRETARY—Before that resolution is submitted I want to read section 2 of article IX. of the Constitution.

The Secretary read section 2 of article IX.

MR. WALL—This does not recommend for adoption; it merely says it is the sense of the Master Car-Builders' Association. I think that the majority of the members of the Association who have had experience with freight brakes, are pretty well satisfied that it is necessary to use an air brake, and I think that it would provoke consideration of the subject if a motion of that character is put.

THE CHAIRMAN—Mr. Wall said something about letter-ballot.

MR. WALL—I will take that out and say simply, it is the sense of the convention, etc.

THE CHAIRMAN—I think the motion is out of order as conflicting with section 2 of article IX.

MR. WALL—If that is out of order, my idea, as I said before, is to get some expression of opinion on this that will guide the Committee in selecting the brake which they would recommend to this Association. I now have another motion to offer as a substitute for the one I just made: That it is the sense of this Association that none of the freight train brakes so far brought to its notice, which derive their power through the compression of the draft springs fulfills the requirements of a good freight train brake.

MR. FORNEY—I second Mr. Wall's motion.

MR. WOOD—If there are any gentlemen here who have used brakes of

this character, other than those who have already given their experience, I should be very glad to hear from them on the subject.

MR. KEELER—I should like to know if there have been experiments tried with other brakes sufficient to warrant the passing of that resolution.

The resolution was adopted by a vote of twenty to eleven.

MR. KEELER—I move that the matter of the standard form of car wheel tread and flange be reconsidered.

The motion was seconded. Nine voted yes and fourteen no and the motion was declared lost.

THE CHAIRMAN—The report of the Committee on Passenger Car Framing and Trussing is in order.

MR. BISSELL—As chairman of that committee, I will say that I have been unable to get sufficient data together in time to get up anything new in either plans or models to express the opinion of the Committee, and therefore have no report to make on the subject. I have some plans that I have received since I came here from the different parties, and I can exhibit those plans; but there is such a wide difference in the ideas of the officers of different roads with regard to the amount of material that should be put into a frame and the form in which it should be placed that it seems almost impossible to bring their ideas together. We have, for instance, a road using the Blackstone coupling, which would require more strength in the framing of the car to keep it in line than the Miller coupling. On some roads we find that there is no bracing whatever; they suspend their cars with rods. In others, they use no bracing, except what is required by ceiling the car longitudinally on the outside, and placing the panel work over it; and some object to using anything but whole timbers in long cars. Others admitted splicing; some admit a truss plank; and others object to the use of it; so that there is a great variation of plans, even among the few that we have received. We have plans that embody the principles of a part of the Committee at least, which are sufficient to hold the car in line under all ordinary service, and that we think are very good. I have those plans, and I can spread them out on the table for the members present to examine; but we have no formal report to submit at the present time. It is a great subject. Mr. Miller and myself have taken some time in passing around through the different yards of railroad companies to see the condition their passenger cars were in; and it is a matter of fact that there are very few of the cars that we find that remain in line. The ends droop usually, and between the transoms they sag; and we find, too, that cars made in different shops and made by the same plan do not stand equally well; but there is probably no danger from breaking down. There is not equal need for uniformity in the framing of passenger cars as in freight cars. Passenger cars are usually repaired and maintained by their own companies, and as there is not that necessity of having a uniformity of framing, and as there is no immediate action needed, we considered it better to ask that we be discharged, and that another committee be appointed to report next year, than to submit anything that we now have.

MR. WALL—I move that the report of the Committee be received, and that it be continued for another year, and instructed to present some definite form of car-framing which it would recommend us to adopt.

Mr. Forney read the following letter:

OFFICE OF THE RAILROAD GAZETTE,
No. 73 BROADWAY,
NEW YORK, June 5, 1884.

Leander Garey, Esq., Prest. Master Car-Builders' Association:

DEAR SIR—It is now four years since we published a "Dictionary of Terms used in Car-Building," in accordance with an agreement made with your Association, and during that time many changes in forms and details of parts of cars and many new attachments, have come into general use, so that the Dictionary and its illustrations are not now a representation of the present state of the art.

We wish to publish a revised edition of the book this year, and make it as complete and as correct as possible, and for that purpose would like to have the formal authorization of your Association, and any other action which you may deem proper.

You and Mr. R. H. Soule have already kindly assisted us in this work, and the only object in addressing this letter is to ask for formal authority.

Respectfully,
THE RAILROAD GAZETTE,
By W. H. BOARDMAN,
Treasurer.

MR. WOOD—I move that the letter be referred to the Executive Committee.

Agreed to.

The report of the Committee on Freight Car Roofs was read by Mr. Wilder.

REPORT OF COMMITTEE ON FREIGHT CAR ROOFS.

Your Committee appointed to investigate the subject of car-roofs regret that lack of time, or rather the multiplicity of duties upon the part of the Chairman, has made it impossible to examine the subject as fully as could be wished.

The following circular letter was issued to the members of the Association:

CIRCULAR OF INQUIRY FROM THE COMMITTEE APPOINTED TO MAKE A REPORT ON FREIGHT CAR ROOFS.

AT THE ANNUAL CONVENTION, TO BE HELD IN SARATOGA, BEGINNING JUNE 10, 1884.

To the Members of the Master Car-Builders' Association:

Assuming that the first object of a roof upon box cars to be protection of the contents of the car from the elements, and second, to assist in giving strength and stiffness to the sides and ends of the car, and considering that car roofs are now commonly classified as follows:

1. What are known as double-board roofs, with or without felt or other lining between the boards.

2. Single-board roofs covered with tin or other sheet metal.

3. Roofs made of metal sheets fastened to carlines, etc., and covered with single boards.

Which of these forms of roofs, or others of which you may have knowledge, will best meet the following requirements, and what will be the relative cost and cost of repair ?

1. Absolute protection from dampness, caused by rain or snow ?
2. Least danger from being disturbed by wind ?
3. Least danger from being damaged by nails being driven into it and men running over it ?
4. Least danger from fire ?
5. Best style to give lateral and diagonal stiffness to the car top. Also, whether some plan of diagonal bracing or tie rods should not be adopted ?

Please send this Committee drawings or descriptions of such a roof as you would recommend as a standard, showing particularly the method of fastening to carlines, ridge-poles, side-plates, and end-plates, and also please state your reasons for recommending the paticular style of roofing.

F. M. WILDER,
R. C. BLACKALL,
D. HOIT,
} *Committee.*

Answers to the above circular should be sent to F. M. Wilder, Chairman of Committee, New York, Lake Erie and Western Railroad, Susquehanna, Pa.

Replies to this circular were received from twelve members. There is quite a diversity of opinion in regard to what style of roof is the best. Many favoring double-board roofs, some with felting between and some without; others prefer what is known as the Winslow roof or one of a similar construction; while the universal experience as expressed seems to be against what are known as "tin roofs," that is, single board with thin metal covering.

The question of cost will enter largely into the adoption of car roofs, as a standard depending to some extent upon where the cars are to be built. In a region where pine lumber is cheap, where good, clear, pine will not cost more than $30 per M., the double-boarded roof would probably be fully as cheap as the single board with tin covering. But where good pine costs $40 per M. a board roof will cost as much as the Winslow or other metal roof with board covering.

It is generally thought by those who answered the circular that the roof should be diagonally stayed, although your Committee has not found any road that has adopted any particular form of bracing. We deem it almost absolutely necessary in cars having roofs with metal plates, either above or below the boards, that the roofs should be stayed diagonally.

Cars have been found on which the single boards were nailed

on to the purlines and pieces running from one purline to the other, being made up from the short pieces of waste from the sheathing of the cars. These cannot be seen when covered by tin, and as they give no stiffness to the car the twisting of the roof about soon starts the joints in the metal cover and opens the seams to the elements, breaking off the nails and completely destroying the roof.

Mr. Robert Miller, of the Michigan Central Railroad, strongly recommends what is known as the "Hutchins roof," which is a double-board roof with a lining between the boards made up of felt, canvas and other materials. The method of construction is described as follows in the circular of the manufacturers:

"It consists of two layers of our hair fabric roofing applied to two layers of felt and canvas, which are placed between the boards of the roof. The lower course of boards reach down to the edge of the cornice, then a piece of canvas eighteen inches wide is nailed one inch down on the cornice and then brought up over the edge and nailed on top of the lower course of boards; we then cover this canvas with our hair fabric roofing; then we place a layer of felt over the canvas, on each side of the roof, reaching up to within five inches of the edge of the roof; the felt is then covered with our roofing; we then place over this, on each side of the roof, another layer of felt reaching from within twelve inches of the edge of the lower course of boards up over the ridge eight inches and lapping on to the under course of felt each side of the ridge; then we cover this layer of felt with our roofing, and thus we have two layers of felt with roofing between and on top of the same down to within twelve inches of the edge of the roof, and from there down to the edge of the roof there is one layer of felt and one layer of canvas with roofing between and on top of the same. The top course of boards is then laid on to the top course of roofing and fastened with barbed wire nails and when sawed off is allowed to project over the edge of the cornice two inches.

"In the construction of our roof, coarse boards of any width are used.

"The object of the canvas being fastened to the cornice and brought up over the edge and fastened to the top of the lower course of boards, is to prevent any water from backing up or following up the cracks of the lower course of boards and getting in between the lower course of boards and the plate; thus, we overcome the main difficulty in the double board or fluted roof.

"Our roof can also be applied in the same manner as above described to old double-board roofs, where the under course of boards is sound, by simply removing the upper course of boards and sawing the under course off even with the cornice.

"It can be applied to old tin roofs by removing the tin, and also to old iron roofs by simply sawing off, even with the cornice, the course of boards which cover the iron roof. Thus, you can save in each case the under course of boards, which is wasted in applying an iron or double-board roof."

Mr. Miller says that with this roof properly put on, there is

no need of any diagonal bracing, and is found very effective in the repairs of old roofs.

No drawings were sent to your committee and we have not had time to design any roof which we would recommend. Your committee would therefore ask that the subject be continued for another year, and they hope that their report will be freely discussed, so that they will have some guide for their future deliberations.

F. M. WILDER,
R. C. BLACKALL,
D. HOIT,
} *Committee.*

MR. KEELER—I move that the report be received, and the committee continued another year.

MR. WILDER—If Mr. Miller would state how this roof is put on, it would please me.

MR. MILLER—It is not practicable to get a double-board roof now, and we were obliged to look around for some substitute, and we used a composition made of pine tar, rosin, oil and refuse from the salt works at Saginaw, which makes it so that it will not evaporate. By putting that in between the courses of boards we were able to use a cheap class of lumber—anything that had sound knots; no loose knots could be used. It has worked very satisfactorily. We have perhaps a thousand cars with that on—perhaps more.

MR. WILDER—I would like to hear from the members as to the way that roofs should be fastened, as to whether it is better to use screws or steel nails, or any other method of that kind.

MR. McILWAINE—I think nails are equally as good as screws as at present used; they are all driven in.

THE PRESIDENT—Probably it might be well to ask any who are continuing the practice of using screws to signify the same.

MR. BISSELL—Is not the barbed nail as good as a screw, even if the screw is turned in the right way? I think it is.

The motion was carried.

THE PRESIDENT—It has been suggested that the report of the committee to select a place for holding the next annual meeting, be called for and talked over and then postponed until to-morrow.

The report of the committee was read. It recommended Baltimore as the place of meeting.

THE PRESIDENT—It would be in order now to suggest other places.

MR. KIRBY—I would name the City of Cleveland. It is a central point. A man can reach it from the east, west, north or south, by one day and one night's travel.

MR. MILLER—I would name Niagara Falls.

MR. BISSELL—I think this has proved a very pleasant place, and I think one as near like it as possible is Long Branch.

MR. KEELER—I suggest Watkins' Glen.

MR. LENTZ—I would suggest Fortress Monroe. I had a telegram from

the proprietor stating that he could accommodate the Convention at three dollars a day, if the Convention were held prior to the 15th of June.

MR. WILDER—I have noticed that when the conventions of this Association and of the Master Mechanics are held in watering places and not in large places, the attendance at the meetings is larger than where they are held in large cities.

MR. DEMOREST—There is a large hotel at Fortress Monroe, that will accommodate about nine hundred. At any season of the year, there will be plenty of room there.

MR. BISSELL—I would suggest that the matter be settled now, as there are more here now than will be here to-morrow morning.

MR. FORNEY—I move that a vote be called on these places, and that each member state his views, and that the final decision be postponed until to-morrow. I would suggest Washington as a place of meeting.

MR. KEELER—I move that we proceed to select a place by ballot.

Seconded.

MR. FORNEY—I hope the convention will not select Baltimore, as the hotel accommodations there are very poor.

MR. PACKARD—I do not think that there is a hotel there that could accommodate this Convention.

Fortress Monroe was finally selected as the place for holding the next annual Convention.

On motion of Mr. Cloud, the Convention adjourned until 3.30 P. M.

AFTERNOON SESSION.

The Convention was called to order at 3.45 P. M.

On motion, the reading of the minutes of the morning session was dispensed with.

The President appointed T. L. Chapman as a committee to prepare a memoir of W. J. McFarland, of the Chesapeake and Ohio Railroad.

THE SECRETARY—I would like to call up a matter that was acted on yesterday, that is, in regard to the lettering of line cars. I am in doubt as to whether it was the purpose of the Association that it should be submitted to letter ballot; and in order to get over that difficulty, I would offer the following resolution:

Resolved, That the methods of marking cars, recommended by the Committee appointed to report on that subject, and which were amended by the Association, be referred to letter ballot for adoption.

MR. C. E. GAREY—I would like to inquire if that comes under the rule as to the adoption of standards or the expenditure of money.

THE SECRETARY—It comes under the rule of the adoption of standards, or rather it is a question for the Association to determine whether it shall come under that or not.

MR. ADAMS—I think I was called out before that discussion was closed or a decision arrived at. I would like to inquire if that has reference to local cars as well as line cars.

MR. SOULE—The gentleman will remember that the committee made an

apology in that respect. They were not instructed to report on the system of lettering box cars other than those in line service, but they did so, and were willing to see what stand the Convention would take on the subject.

THE PRESIDENT—It would resolve itself into two distinct questions, I should judge, one with reference to line cars and one with reference to local cars, that should be submitted to letter ballot.

MR. ADAMS—I think our people would hesitate very much in regard to changing the lettering of local cars. The line cars we have always been accustomed to letter as the general manager of the line has directed, and I supposed we were subject to the general manager's directions in regard to the lettering of line cars.

The motion was carried.

THE SECRETARY—I move that the Committee be requested to furnish the Secretary with drawings, showing the methods which they propose to submit to letter ballot.

THE PRESIDENT—The Committee would be prepared to do that without a vote. Is the Committee ready to report on side-dumping and drop-bottom coal-cars?

MR. TOWNSEND—I would say, as Chairman of that Committee, that I did not receive any notice of it until quite a late date, and that I took a good deal of pains to inform myself, not being accessible to other members of that Committee. I was not prepared to make a report, and would ask further time. (The rest of Mr. Townsend's remarks were inaudible to the reporter.)

On motion, further time was granted to the Committee.

THE PRESIDENT—Is the Committee on Automatic Freight-Car Couplers ready to report?

MR. MARDEN—We are ready to make our report and would call on Mr. Charles Pratt, who has acted as Secretary of the Committee, to read the report.

The report was read by Mr. Pratt.

REPORT OF COMMITTEE ON AUTOMATIC FREIGHT-CAR COUPLERS.

Your committee appointed to make a report on "Automatic Freight-Car Couplers," respectfully submit the following report:

We have sent out the following circular to all the representatives of the different car departments, embodying the following questions:

CIRCULAR OF INQUIRY FROM THE COMMITTEE APPOINTED TO MAKE A REPORT ON AUTOMATIC FREIGHT-CAR COUPLERS,

AT THE ANNUAL CONVENTION, TO BE HELD IN SARATOGA, BEGINNING JUNE 10, 1884.

To the Members of the Master Car-Builders' Association:

1st. In your judgment would there be a large saving to the railroads of the country by the adoption of a standard automatic coupler?

2d. Would the adoption of such a coupler be safer for train men?

3d. Is it practical or desirable to adopt such a coupler for all new constructions or renewals?

4th. If so, will you please make any suggestions which may occur to you as to the best methods to secure these results.

5th. Which, in your judgment, is the simplest and most economical freight car-coupler in service, all things considered ?

6th. Are there any practical difficulties in the way of adopting a standard automatic coupler ?

7th. If any, please say what, in your judgment, they are.

8th. If you were asked to adopt a standard freight-car coupler for your road, what one would you select ?

J. W. MARDEN,
F. D. ADAMS,
R. C. BLACKALL,
} *Committee.*

Replies to this circular should be addressed to J. W. Marden, Chairman of Committee, Master Car-Builder, Fitchburg Railroad, Boston, Mass.

The Committee received twenty-four replies to this circular, twenty-two of which have answered the first three questions in the affirmative, and two have answered the questions in the negative.

Twenty-two have answered "no" and two "yes" to the sixth question.

In answer to the fourth, fifth, seventh and eighth questions a diversity of opinions was expressed.

Your Committee have given the subject careful thought and have experimented with a large number of couplers during the past year, and we have also witnessed tests, made at Saratoga, of various draw-bars.

We have carefully examined all of the models which have been presented at this meeting, and we find such a similarity of principle involved in them that we would suggest before their adoption that they be referred to the Eastern and Western Railroad Associations for their decisions as to the validity of the patents.

Our classification of the various draw-bars are as follows :

WORTHY OF SPECIAL MENTION.

Archer's, Cowell's United States, Janney's, Ames, Mitchell's, Wilson & Walker's, and the Conway Ball Coupler.

AS MERITORIOUS.

Gifford's, Granger's, Bechard's, Peace & Sankey's, Hilliard's Hitchcock's, Prescott's, Mark's, Howe's, Union, Perry's and Burrill's.

THE COMMITTEE HAVE ALSO EXAMINED

Quackenbush's The Life and Limb Protective Car Coupler, Lancaster's, Smillie's, James Horseley's the Balanced Car Coupler; Barnes', McKeen's, Stebbin's, Williams', Skinner's, the New Era and Blandin's.

In conclusion, the Committee will say that they realize the *importance* and magnitude of the work which has been given them, and they would therefore urge upon the members of this Association the importance of thoroughly discussing the merits of car couplers.

The Committee think that this subject is one which should not be passed over lightly, and that the different Companies represented in the Association, and the public at large, *demand* of us a thorough investigation as to the best coupler, and prompt action in recommending its adoption. We would earnestly request that this Association appoint a committee of experts to be present at the trial or hearing of the different Railroad Commissioners, or any trial ordered by the Executive Committee of this Association.

Respectfully submitted,

J. W. MARDEN,
F. D. ADAMS,
R. C. BLACKALL,
} *Committee.*

MR. MARDEN—I suppose that a majority of the members here present expected that this Committee would report upon some one or two draw-bars, or recommend some one or two draw-bars for adoption by this Convention. The individual members of your Committee have pretty well satisfied themselves in regard to what they would use if they were called upon to adopt a draw-bar. I also find that quite a number of the members of the Convention are tolerably well satisfied as to what they would adopt if they were called upon to select one for use on their roads. After due consideration we found that it would be impossible and also impracticable to report to this Convention any one or two draw-bars to be recommended for adoption. We found that where one of us might find merits in draw-bars, the other or others would find better merit perhaps in some other draw-bar, and we came to the conclusion that it was better for us to lay the whole subject before the Convention as we have done, and leave to them the discussion of the merits and defects of the different draw-bars.

MR. KEELER—Being aware of the difficulties that the Committee had to labor under in order to make even an opinion of their own among so many, I would suggest that this Association hire a commission of experts of one or more capable of managing tests, and that the car-builders give such facilities as are needed for making tests by putting the draw-bars on the cars. The inventors

of couplers, I think, would supply any number that would be necessary to make such tests. Let the Commission appoint a time when they will examine and make tests and report at a meeting to be called by the President of this Association at some place convenient for all to assemble some time this fall, where we can hear the report and, if necessary, have the various kinds of draw-bars there, where we can all witness a test. I think this plan would be productive of better results than to adopt a draw-bar from a model or from any explanation that could be given by an inventor. I would suggest Mr. M. N. Forney, as the practical man, to be on the committee. It seems to me that somebody is needed who can devote more time to the subject than any of the car-builders can. It will require a good deal of time and attention. There is a great deal of work to be done.

MR. ADAMS—I would say, as a member of the Committee, in addition to what Mr. Marden has said, that the Committee themselves found it very difficult to agree upon any one or two couplers. As he said, one of us would see merit in one and another in another; and yet I have no doubt that all the members in the Convention have their minds already made up as to what coupler they would be willing to adopt. We realized the importance of an early decision of this matter or of some recommendation of the Association with reference thereto, on account of the pressure that is being brought to bear on the railroads by the State Legislatures. We are well aware, too, that the Commissions—some of them at least—are looking to this Convention for a specific report. I know that that is the fact with the Massachusetts Railroad Commission; they are waiting for the report of this Convention on draw-bars; they have expected that we would select from the multiplicity of patterns some that we consider meritorious, and present them to the railroads. I do not think they expect us to select one; I do not think they should select one; in fact, I know that that is the sentiment of the Massachusetts Commission, that they would not select any one coupler, but they expect us to indicate by some act some limited number that we would be willing to accept as standards for our different roads; and in view of that we could hardly see our way clear in any other way, except to appoint a Commission or an expert for the purpose of continuing these trials, and as it has been suggested Mr. Forney was the man selected by the Committee. Of course we do not dictate about that, but we would suggest it. We did not suggest that in our report, but we do suggest it individually, that Mr. Forney be appointed by this Convention as our expert to attend the examination and hearings of all of the Railroad Commissioners that have been appointed or will be appointed within a limited time, and also any trials or examinations that may be thought best by the Executive Committee of this Association; and if the Executive Committee should see fit to order any trials, that Mr. Forney would attend them. It would seem from our stand-point that with his knowledge of mechanics and of the manner of conducting tests, that there was no man among us that was so well suited for it and so capable of doing it; and consequently we urged that he be appointed for that purpose and in that way we conceived that we might get at some definite facts in a very reasonable time. This is a matter that perhaps is as important as any matter that comes before us at this meeting, for the reason that the law is pressing us very hard and we cannot put it off very far. They will compel us to do something or take the matter out of our hands where, we believe and every one else believes, it really belongs. I do not think the Commissioners desire to say what we shall use; but they feel pushed

by the public to do something, and with that pressure bearing on them, they are going to do something and if we neglect our duty they will do theirs and the consequences will fall on our shoulders. I think the Convention will agree that it is a very difficult matter with us, with our limited knowledge and with a great similarity between the different couplers presented here, to make any very definite recommendation.

MR. FORNEY—The very complimentary proposal or suggestion which has been made by Mr. Keeler and which has been repeated by Mr. Adams, seems to make it necessary that I should say something, and the fact of my appreciation of that compliment is increased, and not lessened, from the other fact that I appreciate the importance of the work which they think of placing in my hands. I doubt very much whether any of the members realize entirely, or whether anybody else does, how much work would be involved in the task which it is proposed to place upon my shoulders. Therefore I am not prepared to say, before it is more definitely stated what that duty would be, whether I should be willing to accept such a position, and for this reason I hope that there will be a more full discussion of the subject by the members present, so that their views in relation to the coupler question may be brought out more fully before this suggestion takes any definite shape. I presume all of you, by experience, have learned what a weariness it is to listen to the inventors of car couplers. I will say for myself that my days have probably been shortened by them, and if I am to be placed before the public as the person to whom all the car-coupler "cranks" are to address themselves, it will be a very serious undertaking. Therefore, before any definite motion is made, I hope that all will present their views, and that we will know what is to be done before you undertake to say that I shall do it.

MR. KEELER—I would ask Mr. Forney to name some of the points that he wishes to have discussed.

MR. FORNEY—I do not know that I am prepared to do that now. The problem is a very difficult one. I should very much rather hear the members discuss the question before expressing my own views.

MR. ADAMS—I do not know but I have had as much of the coupler question as I want, and I do know that if it was continued for two weeks, as it was last week, I should leave. I do not believe any man could live two weeks through such a trial to his nervous system, and I should regret very much if we burdened Mr. Forney with a care that would shorten his days materially. I think we appreciate him too highly to do anything like that.

In our discussions and examinations we were led to some conclusions a little different from those we had before we commenced the investigation. The idea has gone out, and is entertained by the public, that we must have an automatic coupler. That matter was frequently brought to our minds and talked of, but we had our opinions shaken somewhat in regard to the advisability of an automatic coupler, although the public and the Railroad Commissioners and our Legislatures have an idea that if we could get an automatic coupler, nobody would get hurt on the railroads, and that whenever anybody does get hurt by railroads it is done by coupling cars. While this is kept in view by the public and these parties that we are speaking about, they have lost sight entirely of the fact that an automatic draw-bar is a terribly destructive engine, and we believe that if automatic couplers were adopted universally, our cars would have very much shorter lives; and the expenses for repairs would be very largely

increased. We are very much inclined to believe that we do not need so much an automatic coupler, as we do a safety coupler, and yet the impression seems to be entertained by the Commissioners, if I understand their idea rightly, that we should have something that will couple automatically. Now about nine-tenths of these couplers that are claimed to be automatic in the strict sense of the term are not automatic at all. In fact, the couplers that are automatic are rare, and it is going to be a very difficult thing to get at that until some things are more definitely ascertained. From my view of the matter, if Mr. Forney would accept this position he would have the matter somewhat in his own hands to dispose of. He would not be thronged, as we have been, with a multitude of men waiting anxiously for something to say in the matter; but he could call at his own leisure, have a limited number to meet him at certain days at his office in New York, and look over the matter. If there was a trial appointed, he could arrange it so that he could attend it without being crowded with a multitude as was the case here. I believe that no coupler can have a fair trial where there is such a number of couplers as there were here. Our notion was to have him present as an assistant and help to the Railroad Commissioners in the fall. In this examination by the Railroad Commissioners he could assist them in making a proper selection, and perhaps prevent them from making a serious mistake in getting something that nobody would want. It seems to me that it would be a very necessary and a very great help to the Car Builders of the country, and the railroads of the country to have just such a man as Mr. Forney to represent us before all these Railroad Commissioners at every hearing that they may have in relation to this particular matter.

I would say further that if any parties present have any special favorite coupler I should like to hear them make their claims for it.

MR. BLACKALL—I would suggest to the Committee of Experts that no coupler be tried by them until the same has passed the Eastern or Western Association, to know whether the patent is valid. We find many couplers exhibited to us in which the principle was certainly the same. You take, for instance, the Ames and the Mitchell. I do not see any particular difference between them; and then there is the Archer and some other coupler down at the station which are very similar, and that in a measure troubled the Committee. I think that if that proposition is adopted it certainly would lessen the labor of the Committee.

MR. WILDER—There are several matters to be considered. The first would be the functions which we expect the car-coupler to perform; whether it is to couple with itself and whether it is to be able to couple in connection with the present system of coupling cars with an ordinary link and pin, and whether it is to couple with other couplers which are supposed to be automatic; and then there is the question of the cost of the coupler, which would enter very largely into the question whether it is practical to adopt it or not. Undoubtedly if the railroads of this country saw fit in their freight car service to apply the Janney coupler the same as on the passenger cars, to all their freight cars, or the Miller hook, it would probably be a good thing to do, but it would cost, probably, a hundred dollars a car. As to what the coupler should perform, it is a question whether we wish to attach handles so as to uncouple the car from the roof without going between them—whether the coupler man should guide the link in case the car is too low or too high, or whether the coupling itself should hold the link in the right position. There are a good many questions of that

kind which ought to be considered in connection with the car coupler. We saw on the trial to-day a good many that made a coupling going at the rate of probably ten miles an hour; but there was a great difference in the cost of those couplers. I should judge it ranged from five to fifteen dollars a car, and all seemed to do the work about the same. If this Association adopts a coupler, they ought to adopt one that could be applied to cars as economically as possible and perform the duties expected of it.

MR. WALL—I think it is almost imperative that we should adopt something or else own up that we cannot. There are a certain number of confusing questions that surround the matter of couplers. I think we can here this afternoon decide on a certain number of principles which any coupler should fulfill. If we decide on those principles, then they will be known as the opinion of the Association and inventors who will take the question up, can see what conditions they must fulfill when they invent a coupler; and those who have invented couplers which do not fulfill those conditions will see that there is very little opportunity to present their coupler before this Association. If any one were going to hire a man to roll wheels, and somebody were to ask us to make specifications of that man, we could do so; we would say that the man must be healthy, strong, agile, quick. We can also say the same thing about a coupling. In order to bring this matter to an issue before this meeting, I would like to submit a motion that it is the sense of this Convention that any automatic coupling presented here should couple in a vertical plane; by that I mean it should be able to slide up and down. In all these couplings which contribute the weight of one car on to another car, I consider as objectionable, and if we settle on that principle, we will also have the advantage of a car having a considerable lateral motion. After we determine whether this is a good principle, we can go on to some of the other principles, and if we do adopt this suggestion of Mr. Keeler that a committee of experts be appointed, they will have certain points given them in making their judgments. I therefore make the motion that the automatic car coupler to be presented to this Convention shall couple in a vertical plane.

MR. KEELER—I would add to that, shall couple automatically in a link having one of the old-fashioned draw-bars.

MR. ADAMS—If the Convention will remember, some few years ago when this coupler question began to be agitated quite strongly, there was a vote taken, and there was, I think, unanimity in the Convention in regard to what should be the principle involved in all couplings to be presented to this convent tion for acceptance, and that was this: It was one of the principal points advocated, and advocated quite strongly by our President and others, that any coupler presented here for adoption by this Convention should be without pin or link. I think I may say that nine-tenths of the car-builders of the country are encouraging and assisting, to a very great degree, in producing these car-couplers with both pin and link. Now we go back on our own action by this course. My own conviction to-day is just as it was at that time, that we need an automatic coupling that will couple under all circumstances alluded to by Mr. Wall and Mr. Keeler.

MR. WALL—I do not think I quite understood Mr. Keeler's amendment. Some of the members sitting near me say that he means that any coupler we shall adopt shall couple automatically with the old style link and pin. The reason I put my motion first about the vertical plane is because if that is carried,

that it is the sense of the meeting that a coupler should couple in a vertical plane, it will necessarily dispose of the link and pin, because the link and pin do not couple in a vertical plane.

MR. KEELER—There are now in the service about eight hundred thousand cars that couple with a link and pin, and in order to take any step forward it will take time enough to convert those from a link and pin to a hook draw-bar, and I do not think that the railroad companies throughout the country will take such a step at present. I would be in favor of doing that if it could be done; but I know of a great many companies in the west that will not adopt any such draw-bar; but they would take up a draw-bar that couples with a link and pin.

MR. WALL—I think perhaps Mr. Keeler and I misunderstand each other. I believe in a coupler that will couple with a link and pin. I understand now that Mr. Keeler means couple, not couple automatically.

MR. KEELER—Couple.

MR. WALL—Then I accept your amendment.

MR. WILDER—If we pass that resolution, we should probably have to adopt the Janney, or some coupler of that kind.

MR. WALL—I have to take exception to what Mr. Wilder says. There are several couplers of that kind presented, and if this resolution is passed, it is probable that many others will be presented. There are several couplers I can call to mind. The Miller couples on that principle, and that is one reason of its great success. Then there is the Cowell. Then there are others whose names I cannot recall at the present time.

MR. WILDER—Will Mr. Wall state what he considers the advantages of couplers coupling in a vertical plane.

MR. WALL—I said, Mr. President, in my original remarks on this subject, that there were certain advantages which followed from coupling in a vertical plane. I think that all would admit that the Miller has been a pretty satisfactory coupler. The great advantage of a vertical coupler, is that notwithstanding the inequalities of the track, the different height of cars, you can couple with any kind of cars with a coupler that couples in a vertical plane.

MR. CLOUD—I thoroughly agree with Mr. Adams in this matter. He has mentioned to us the fact that I was not aware of before, that this matter was taken up in this same way some years ago by the Master Car-Builders' Convention, and that it was there thought that the loose link and pin should be done away with, and it seems to me there are very good reasons for our taking some such action as is now before the house, and I will endeavor to give some of the reasons which formulate themselves in my mind why that is so. In the first place, the coupling with the link and pin of the present day is difficult in many cases, owing to the varying heights of draw-heads, the curvature of the track and other circumstances, because the link cannot be driven far enough into the second draw-head to get the pin down. There are numerous cases where there is difficulty in coupling and where you have nothing at all but a straight bar of iron going down through the link. Now in a majority of these patented couplers, which use either loose or stationary links, the draw-heads are filled up with stuff of some sort or another, usually metal, and while they may couple very well on a straight track or with cars about the same height, they certainly will get into a greater difficulty in coupling various cars together, because of the less room in the draw-head for the link. Now if a coupler

should be adopted which couples with a loose link, the difficulty would be very much increased by the fact of all such couplers requiring links of a certain length. Owing to the varying length of the links that are scattered throughout the country, which would have to be used, they would not couple; there would be all sorts of difficulties, in coupling cars and aside from the mechanical difficulties which I have mentioned, of our getting along with any one set of these couplers, there is another point. Suppose that certain of the railroads represented here should adopt one of those couplers, and suppose other railroads with whom they should connect should adopt another of those couplers, what are you going to do when they come together? I do not believe they would couple. And then the matter of patents is so much involved. In some patents it may be that there are not more than two words in the whole specification which make it patentable. Now the great difficulty of unraveling the rival claims and ownerships, would probably be very great, and I do think there is much to be gained if we can establish the one principle that a satisfactory automatic coupler or satisfactory freight coupler or safety coupler, if you please, whether it is automatic or not, should perform the coupling along a vertical line or plane, which is substantially what is in use to-day on passenger cars. It does not mean necessarily any of those that are in use on passenger cars to-day. Several others have been proposed recently, and I have no doubt that others will be proposed.

MR. WILDER—In calling attention to Mr. Wall's resolution, which calls for the adoption of the Janney coupler, or some similar device, I did not mean to be understood as saying that we would be obliged to adopt the Janney or any other device now in use, but I wanted to bring before the Association that as we understand it here, the one selected must be a coupler of that kind; and if we should adopt this resolution, it would necessitate the use of a very expensive coupler as the standard of this Association. A coupler of that kind could not be applied to our freight cars for less than $15 a car, or probably $25.

MR. KEELER—With regard to getting entangled with patents, the Western and Eastern Railroad Associations deal with that entirely. We use nothing that is patented without first having the Western Association pass upon its validity. If a case comes into Court, the Association takes care of it in all cases.

MR. WILDER—The question of deciding upon the validity of the patent in regard to the coupler we are going to adopt, seems to me entirely foreign to this question. If a man came in with a coupler which was an infringement of a dozen different patents, if it was the coupler we wanted, I do not think the fact that it might infringe some other patent ought to be considered at all.

MR. CLOUD—I might have quaified the last objection that I made, because it has been given more weight than I intended it should have. I think, of course, that the mechanical objections are the great objections. I have no doubt of the ability of lawyers to do almost anything they want, to their own satisfaction, at any rate. The question Mr. Wilder brought up ought to be looked at, it seems to me, in this light, whether the entailed expense of the adoption of something that is not a mechanical success, would not reach, perhaps, the original cost of something that would do the work from the start. In other words, I think if any who have to deal with this question are competent to decide what is a proper thing mechanically, they are the gentlemen here;

and if we allow the question of cost to enter too heavily into our considerations and lose sight of the mechanical questions which we are really the most competent to deal with, we will certainly be to blame; and if we allow a coupler to go into use as an automatic coupler, and one is put on one series of roads and another on a certain other, and after awhile we find that the cars will not couple, it seems to me that it would reflect very seriously upon us as capable of expressing good judgments.

MR. KEELER—I was going to say, the suggestion of Mr. Forney to make tests and to determine mechanical parts is what was in my mind when I suggested him for the expert. If he considers mechanically that one article is so superior to another as to warrant the expense of adopting it, he would make such a report.

MR. ADAMS—Mr. Wilder alluded to the necessity of using an expensive coupler like something we use on passenger cars, if we carry out Mr. Wall's suggestion. Now I do not want to advocate any particular coupler. There have been patentees who have omitted to comply with the requests and requirements of this Association, and there are already in use on a large number of cars, and have been in use for a considerable length of time—some for six years and more—couplers which couple automatically, and which seldom fail; that use neither pin nor link, that couple themselves, and supply their own link to couple with the old draw-bar. Now Mr. Wilder speaks about their cost as being a matter that we should take into account. I am as ready to admit as any one that we should study economy in all our actions, and perhaps no one has it enforced on his mind more strongly than I have. Economy is a point that our people study. and yet we do not mean to be penurious. Another thing is our officers see that the matter of expense is not to be considered in this matter of couplers. That is a secondary point. The question is as to safety. Economy and safety are among the first principles that our people keep in mind all the time.

Now, here is the Wilson & Walker coupler. It furnishes its own pin and link. It is in use on 100 or 200 cars. It couples ordinarily well. Here is the Ames coupler. It has been in use, continually, to my certain knowledge, on 100 cars for over three years, on 50 for over six years; and never has one of them broken. Take the cost of links and pins as the basis of our expense—about $9,000 a year for 600 cars. Now, if it was formed upon the basis of 6,000 cars costing $9,000 a year to support, it would cost about $1,200,000, I believe, to supply the links and pins of this country. Now, a million dollars will go a great way towards supplying couplers. If you use the Janney coupler, if I understand the Janney coupler you must use a link and two pins to couple with the old bar. If you use the Cowell coupler you must use a link and two pins. If you use the Wilson & Walker, or the Ames, you must use one pin. Now, these pins are to be considered, and I think they are very important. I think I should not be far out in the statement that it is more unsafe to couple an old-fashioned car on to a hook than it is upon a square-headed buffer. Everybody knows how unsafe it is for a man to go between cars with a Miller platform and the old-fashioned draw-bar.

MR. WALL—We would still have the link and pin after we got through with the process if we got one of the couplers which Mr. Adams evidently prefers. He is willing to grant that we want to do away with the link and pin some way, sooner or later. If we select a coupling which is going to take the old link and pin, we have a coupling which you may say is tentative; it is good

for a time. Now, if we could get a coupling which we would couple satisfactorily with itself, and also couple with the ordinary arrangement, why, then, after awhile, when we get the standard coupling in use we will have them all the same. We will do away with these objectionable features. I think, Mr. President, we are going a little off our resolution as to vertical plane If we could get that, and either vote for it, or vote it down, we can pass on to the next principle.

MR. ADAMS—I would like to have Mr. Wall explain what he means by necessitating the old link and pin. It seems to me perfectly clear, if the Wilson & Walker, or Ames or Mitchell, were adopted, that after the old couplings were done away with we shall not want any links and pins. I said that they furnish their own link and pin, and they do. As soon as the old cars are used up, and these are brought into use generally there will be no links and pins.

MR. McKENZIE—I would like to hear Mr. Adams explain if the links he speaks of never give out, as compared with the ordinary link.

MR. ADAMS—I do not suppose, Mr. President, that we will ever get anything that will not wear out. I will say in connection with that, that we have had fifty cars equipped with the coupling I spoke of, running three years, and none of the couplings have given out. Mr. Kirby has had fifty cars in service six or seven years, and he has had similar experience with them, I think.

MR. MARDEN—I think we are getting pretty thoroughly convinced that the subject is deeper, perhaps, than most of us thought of before we took hold of it. Now, in regard to this matter of links and pins, I do not think that it should be taken into consideration at all in regard to the draw-bar which we should adopt—I mean to say the matter of links and pins that we should have to use until we could get rid of all the links and pins. I do not propose to say to you, gentlemen, what my preference as to the draw-bar is, but I do believe that we need additional information in regard to the matter. We should know all the difficulties that come up, and we want to look at it from more than one standpoint. The more I have studied this matter during the past year the more I find that the difficulties are not small. I do not believe that we could get a vote in this convention to-day, or next year to adopt one draw-bar so that it would be the draw-bar for all the roads.

MR. WILDER—I believe that there can be no perfect draw-bar or self-coupler invented in which the principle proposed in Mr. Wall's resolution is not involved. There are many draw-bars now in use. We have adopted one on the Erie road which is automatic in every respect. At the same time I do not think it is as perfect as it should be.

THE PRESIDENT—I hope we will have a more general expression of opinion on this matter. It has agitated the State Legislatures, and you are the parties certainly to give some advice, and I certainly trust that you will not be backward in giving us your opinion.

MR. McELWAINE—There is one point which strikes me as somewhat important. If we recommend for adoption a draw-bar, similar to what Mr. Wall has made a motion for, it will eventually do away with links and pins. Suppose a coupler is adopted for general use. but we still retain the couplers that we have on passenger cars, and this freight coupler that we have in universal use will not couple to them without links and pins. There seems to be a difficulty in this automatic coupler business of doing away with links and pins

entirely, or anything like it. I am rather in favor of the vertical plane rule in order to get away with the links and pins at some future time.

MR. McKENZIE—If I understand Mr. Wall's motion, it does not appear that it confines us to the hook, but a link might possibly be constructed to do the same thing. If we confine ourselves to the motion before the house, and vote upon whether it is advisable to have something that will couple upon a vertical plane, I do not see why a link cannot be raised and lowered just as well as a hook.

MR. C. A. SMITH—There are probably very few railroads in the country that are not putting on safety couplers of some kind, and, if we postpone it, will it not be much more difficult some years hence to bring about the adoption of the standard coupler than now. It seems to me that we ought to do it ourselves without having them come and say: "You shall do so and so." By and by the lobbyists will get hold of it, and you will have their coupler.

MR. MILLER—It does not seem to me necessary that if there is a commission to investigate this subject that we should do what we did with the truck committee, and instruct them on the subject. I believe that the reasons given by Mr. Wall for a coupler to couple in a vertical plane do not present any particular advantages. I can understand well enough that it would be desirable that a car should carry its own load without transferring it; but our trucks are getting so perfect now that I do not think it is necessary. I should be opposed to adopting any device that would make the present system of coupling more dangerous than at present, I believe that the Ames or the Wilson & Walker would do away with links and pins; and certainly the record of these couplings has been good, especially of the Ames and that class of couplers, and I should favor Mr. Wall's suggestion in regard to that. I favor the proposition of appointing this commission, with Mr. Forney at the head. If he needs any assistance, give him power to select from the members of this Association, or any expert in the United States.

MR. HITCHCOCK—The laws of Massachusetts require that we shall put on such kind of automatic coupler as the Railroad Commissioners accept. In that case, what can this Convention decide with reference to this matter. Suppose this Convention should decide upon a coupler, and the Railroad Commissioners of Massachusetts should approve a different coupler, what would you do about it?

MR. ADAMS—I would say that there is no possible danger of that. I have had a good many conversations with those Commissioners, and I know they have great confidence in this Association; and whatever this Association recommends, I know that the Massachusetts Commission will adopt.

THE PRESIDENT—I was in hopes there would be no necessity for me to say anything on this subject, but there evidently is not a subject which pertains to the mechanical construction of railroad appliances which is agitating the public so much to-day as the question before you. Our Legislatures are going to tell us what we must do. Most of the railroad commissions in the different States in the Union that have made reports, have referred to this subject. A number of them have gone so far as to say that the cost of doing this should not enter into the conditions at all. In other words, one commission says that the large expenditure would be warranted if a safety coupler could be used on all freight cars, and that it would release the railroad companies from a grave responsibility. In conversation with one of the Commissioners

of the State of New York, since we have been in convention here, he said that the complaints made to them daily almost of the injury to men while coupling cars were sickening. He further said: "I have made up my mind that it is not only desirable to have a safety coupler, but it is most assuredly practicable."

Now, I do not think there is a man within the sound of my voice who does not agree with the statement of that Commissioner. Now, gentlemen, that being the case, I am very much inclined to think that we should not shift this responsibility any more than is actually necessary. I was in hopes that the Committee would have reported, recommending a certain number, not to exceed three or four, which, in their opinion, could all be used, which would couple with one another and at the same time, couple with the old devices. I see they have mentioned eight. Now, I do not for one moment suppose that they have put these down in the regular order of their merit, as they understand them. I think they might have done so, but if we can get down to eight and the whole eight will couple with one another and with the old devices, and then if, by experiment, with the use of these we could reduce them down to two or three or one, which would be the inevitable result of the process, it would be doing what everybody is looking for us to do. If I could talk to you just as I feel on this subject, I should like to, very much. But I cannot do it. But I certainly feel as though we must do something. This dilly-dallying will not answer. As has been remarked here, if we do not select some which are considered better than any others, in another year, possibly in two years, there will be more automatic couplers or safety couplers than have been represented here on this report of our committee, and the longer we delay this matter, the more difficulty there is in arriving at some conclusion; now, as I said before, that being the case, let us show, by some act of this meeting, to the railroads and to the public and to the Railroad Commissioners, that we comprehend the difficulties and are ready to meet them in some shape.

While I am very much in favor of the suggestion made that a commission be appointed consisting of one, and I do not think we could find a better one than has been suggested, if we hunted the world over, I would put this question in a shape that would release him from a great deal of annoyance and a great deal of trouble, and that by selecting, if we cannot do better, the eight that are here, if these will all couple one with another and with the old devices, and by some suitable resolution placing it before the public as the act of this Association. (Applause.)

MR. WILDER—I fully agree with Mr. Garey in regard to this matter, and would say that our company, appreciating the responsibility that they had towards the public, adopted an automatic coupler as a standard. We have not made a draw-head now in over a year, excepting for cases in repairs where we could not apply the new standard. We are making fifty a day of those couplers and are applying them to our cars as fast as we can. We have 2,000 cars already equipped with them. It does not happen to be one of the chosen ones, but at the same time I think it is as good as any there. We still couple with a link and pin. It will couple with any other coupler when using a link and pin. There has been no trouble with it—in a year and a half of actual service. I should move that if we are going to adopt a certain number that it be placed among them, I mean the Gifford.

MR. WALL—I want to say that I agree entirely with what you have said, that we must have a coupler. But what I propose to do about this matter is,

to take it up exactly as we would take up anything else. If we were going to investigate any subject, we would take it up part by part. Now, I want to get the sense of the Convention on these principles as we bring them up. Of course if I proposed a motion it is because I believe in it, and I feel that if that motion was defeated, it would be, to recur to the simile I used before, taking a lame man to turn the wheel. But if it was not concluded that we wanted a lame man, I should be as earnest in my support as before, provided it was a man with a crutch. Let none of those whose couplers have existed previous to this date, be examined in connection with those which are named. But others coming in afterwards, let them be passed upon, and, if meritorious, added to the eight.

MR. ADAMS—I understand from Mr. Wall's vertical plane that it consists of this hook motion. If he is committing us to a hook coupling, we do not want to make a mistake and adopt a hook coupling.

MR. WALL—It is not necessarily a hook. It may be several kinds of forms. I say that if we pass this now, it will stimulate inventors to make couplings that will involve this principle. It does not involve a hook necessarily. It does not involve anything in particular, except this principle of coupling on a vertical plane.

MR. ADAMS—If Mr. Wall's motion does not involve anything, I do not know that we want to pass it all. I am in favor of reducing the number down to three. I am in favor of reducing it below that, but I do not suppose that would be agreed to.

MR. HITCHCOCK—I would like to ask Mr. Adams if there is not one of those three that he prefers to the rest.

MR. ADAMS—There is, but I do not know that I am obliged to tell you which it is.

MR. HITCHCOCK—It seems to me that this Committee have really come to a conclusion in their own minds, and have failed to give us that conclusion, and still they want to come around little by little, until they define what particular draw-bar they require.

MR. ADAMS—I beg Mr. Hitchcock's pardon. We say, as a Committee we could not agree; as individuals, we adhere to our own opinions.

MR. HITCHCOCK—It is evident that that was the case. Perhaps three draw-bars were preferred. Now Mr. Adams wants to get them down to three, and it is patent to my mind that those three represent the Committee of Three. How is that, Mr. Adams?

MR. WILDER—I think, Mr. Chairman, that that discussion is not germane to the question.

MR. CLOUD—I do not think that the motion is understood by the gentlemen here. But the way I understand it is this, we find that it is the sense of this meeting that the best automatic coupler, mechanically, will be the one which, when it is generally introduced, will couple without any link. I will ask Mr. Wall if that is the sense of his motion?

MR. WALL—Yes; that is the sense of my motion.

MR. CLOUD—I am very much afraid that we are going to bar ourselves from advancement by voting on this motion before it is understood. Mr. Wilder, I believe, understood it awhile ago, and admitted that mechanically it was the best thing; and I will move to amend the motion as it was put and to introduce the word "mechanically." That is to say, that it is the sense of this

Convention that the best coupler mechanically is one which performs the coupling along a vertical plane; so that after it might be generally introduced, there would be no further use of any link; and I hope that amendment will be accepted and that the members will now clearly understand what is intended. I do not believe that there is any mechanical engineer or master car-builder or any other man who is thoroughly familiar with the operation of railroads, here, who does not believe that mechanically considered the most satisfactory coupler is one that couples along a vertical plane; so that whatever the difference of heights of cars might be, within certain limits, the coupling would be performed. I believe all will admit that it will be a good thing ultimately to abandon the link. But, of course, in the process of transition from the present to the proposed practice the coupler used, whatever it may be, must couple with the old one. I therefore think that the eyes of the whole country are upon you here in this Convention this afternoon. They are not watching you, perhaps, with very much eagerness, to get the result early, or anything of that sort. But they do expect to get something from you to-day. And I shall go away from here thoroughly ashamed of myself as a member of this Convention, if we cannot agree upon one mechanical principle that a coupler ought to fulfill. Our people look upon this as a test case of the success of this organization. If we do not this year do something in this matter—I do not mean appoint a commission, that is somewhat shirking a duty—if we cannot pronounce on some principles that should be involved in a self-coupler, we shall be objects of derision. I think we ought to do more than that. I do not think we ought to say that any one, two or three couplers should be adopted. But I think we ought to point out the principal mechanical features that self-couplers should possess and go still further and indicate a little more in detail than that what the features should be that would make the successful coupler. I think the members here ought to lay aside all petty feelings in this matter. I have not any coupler to recommend here. There are at least three if not four which are in the category of this motion, any one of which might be the coming coupler and I have not looked into the matter enough to say now which I would prefer of those. But I do think that it behooves us to say at least what the principle should be that should govern this coupler. I do not think that enough of the members have expressed themselves so that the Convention really knows how it is going to vote. I think that many of those who have not expressed themselves should do so, in order to give the others some indication of how they feel before the vote is put.

MR. ADAMS—Mr. Cloud said that he had in mind four that would comply with the mechanical principle he required. Will he name those?

MR. CLOUD—I will be very glad to talk the matter over with Mr. Adams, after the Convention, if he wishes to know. I prefer not to name any coupler on the floor.

MR. WALL—I accept Mr. Cloud's amendment, that the word "mechanically" be inserted.

MR. BLACKALL—I understand that it is proposed to leave it to this Commission. We are to tell the Commission that there are only two of all the couplers exhibited here that they must consider. All the others must be laid aside. That is what I understand by Mr. Cloud's motion. There are only two couplers on exhibition, the Janney and the Cowell, that meet the requirements of Mr. Cloud's resolution.

MR. CLOUD—I am not aware what couplers are exhibited here to-day. If

there are only two here I am sure that they do not cover the ground. There is no occasion for this Convention to appoint a commission.

MR. WILDER—The resolution is very plain. It confines us to mechanical principles. I believe that the principle involved in the resolution is correct; only I do not see, if we pass this resolution, that it is going to hinder us from adopting a resolution later that we recommend to the members of this Association one of the eight or nine, or four or five couplers, as the case may be, which would fulfill certain functions and which would tend to correct some of the faults which are found now with the ordinary hand coupler. But believing that the correct principle for a coupler is embodied in this resolution, I think it ought to pass.

MR. MILLER—I suppose that this is for the benefit of the Commission, for their guidance, if they should be appointed.

MR. CLOUD—If this motion prevails now it does not interfere with any other action. Any Commission that might be appointed would simply have this as a guide.

MR. BISSELL—One little matter of experience comes to mind just now. Will not the same advantages accrue from the use of a vertical line coupler with a freight car as with a passenger car?

The motion was carried unanimously.

MR. WILDER—Now, Mr. Chairman, a resolution would be in order, recommending to railroad managers that a certain number of couplers have been found to have merit, and in case they haven't any coupler which embodies the principles that this Association agreed upon as the correct mechanical principles, that they would adopt the couplers so recommended until the correct coupler should be found.

THE PRESIDENT—I would ask the Committee who made this report on automatic couplers if the eight mentioned here will couple with one another and with the old coupler?

MR. ADAMS—Some of these will couple with each other automatically and many of them will not. For instance, the Wilson & Walker and the Ames will couple automatically. The Wilson & Walker and the Ames will both couple with the Archer automatically. But to couple with the Cowell you must use the link with a good deal of care; and you would have to use the link with the Ames, and you could not do it automatically. I do not know but I am mistaken about the Archer coupler, but I think I am right. You have to use a link between any of them and the Cowell.

MR. VERBRYCK—I would like to ask whether it would not very much increase the danger to our men to couple cars equipped with these couplers and with the old link?

MR. KIRBY—I do not see why we should spend so much time here in discussing a draw-bar that shall simply couple vertically when we can use one that will perform the same functions, namely, a loose link that will adapt itself to four inches difference in height perhaps. And where is the difference whether we take a loose link, which adapts itself to a variation of four inches one way or whether we take a coupler that will slip up and down vertically four inches? I supposed that when this matter was first brought up that one idea of it was to dispense with the link and pin, and at the same time couple with any other draw-bar that it may come in contact with. I believe those are the principles we are after. Now, I believe that we could vote on this draw-bar business all the

afternoon, and we wouldn't get enough, I think, to decide on any one or two or three draw-bars. And then there are a great many of those automatic couplers that are simply a contrivance of a pin and work very well while they are new. After a while they become a little out of order and they will not work at all. The pin becomes worn so that you cannot pull it without having a good deal of slack. I think that if we are going to have a car coupler we want something that will dispense with a link and pin—carry its own link and couple readily with any other draw-bar, and a draw-bar which will fulfill these requirements it would seem to me is about all that we can ask for.

MR. WALL—I submit, Mr. President, that in passing the motion which has just been carried, we have done away with the link and pin coupling or any coupling which involves that principle. We have voted that it is the sense of the meeting that the coupler which best fulfills mechanical principles shall couple in a vertical plane; that necessarily does away with links and pins.

MR. ADAMS—There is now in contemplation and almost perfected the adoption by about one hundred thousand cars of certain lines of railroad here of a certain coupler. I will not say that it is adopted, but I will say that it is on the point of being adopted, and I have no doubt will be adopted in a very short time, perhaps within two weeks. Now, I would like to ask the Convention what influence that will have on the railroads of the country—one-eighth of the cars of this country? Would not that have a great bearing on what shall be the coming coupler? I think the strong probability is—the very strong probability—that within a very few weeks, and perhaps within two weeks, a system that comprises somewhere near one hundred thousand cars will adopt that coupler.

MR. WALL—I submit that we want to influence these gentlemen who are going to put couplings on one hundred thousand cars. It is for that reason that we laid down the mechanical principle which we did just now and which was accepted by the meeting. As Mr. Adams makes his remarks about these people who are going to take a certain coupling, it is in a certain sense a threat to us. It is an attempt on the part of the tail to wag the dog. I want to be the dog and to wag this tail, and to tell those people the principles that ought to be embodied in a self-coupler.

MR. MILLER—Does that coupler do away with danger in coupling? That is the question Mr. Verbryck wanted answered.

MR. ADAMS—That very point was largely considered by these same companies, the danger of coupling with that class of couplers while the old couplers are still in existence, and I submit to the Convention and to car builders generally if it is not a fact that it is extremely dangerous to couple any shape of the Miller hook or anything of that character with our present system of couplers.

MR. WILDER—I propose the following resolution:

Resolved, That it is the sense of this Convention that draw-bars have been found which couple with draw-bars in common use, and would recommend that they be selected and experimented with by railway companies, unless a more perfect coupler can be found.

Seconded.

MR. ADAMS—I will move, as an amendment, that we reduce that down to about four anyway, and I will make them the Archer, the Wilson & Walker, the Ames and the Cowell.

MR. BLACKALL—I hope Mr. Adams will not be too hard on these roads that have a hundred thousand cars.

MR. WILDER—The Cowell and the other coupler would not be germane to the resolution, because the resolution says that they would couple automatically with the vertical drawheads. I do not understand that the Janney and Cowell will couple automatically with any but themselves.

MR. MARDEN—I take the ground that the bar mentioned in the resolution will not couple automatically with the old-fashioned draw-bars that have links, and there is no draw-bar among them that will couple automatically with a link, and I take the ground from this fact, that any old-fashioned mouth draw-bar is liable to have the link thrust around one side or the other so far as to strike the edge of the draw-bar and it has to be manipulated by the train man in order to have it couple with any of those couplers.

MR. WILDER—I will say that I have seen the Miller draw-bars on passenger cars fail to couple not one but a dozen times. Still we consider that to be a correct principle and the one that is nearest right of anything we have done. If these others fail once in a hundred times that is no reason for saying they will not couple with an ordinary draw-bar.

MR. MARDEN—The natural position and mechanical construction of the Miller is such that it will couple automatically, if it is in repair. The old-fashioned draw-head may be in perfect repair and the link may not be broken, but its position may be such that it will be thrown out of the way so that it will not couple automatically.

MR. McKENZIE—I move to amend by reducing the number to two that couple automatically with a link, and to hook couplers, whatever they may be. Seconded.

MR. WALL—I hope that Mr. Wilder's motion, in its present form, will not prevail, for the reason that the sense of the meeting is committed to the statement that a coupling, to be a mechanical success, should couple in a vertical line. Now, on top of this, they recommend a certain number of couplings that have not that principle. Now, Mr. Wilder might make his motion to the effect that it would be well to try a certain number of couplings, but I think that he should include some couplings that a great many roads have been trying. Like Mr. Cloud, I do not come here to mention any special form of coupling. I do not know that the Pennsylvania Railroad and the Pan-Handle Railroad are prepared to adopt any special form of coupling at the present time. We wanted a principle like this to prevail, so that it would guide us in sifting down all the various forms of coupling. If it is thought, as Mr. Wilder has said, and others have said, that it would be well to endorse a certain number of couplings, let us include some of them that couple on a vertical plane, which a great many roads are using. The Pennsylvania Railroad is using couplings that couple on a vertical plane, also the Chicago, Burlington & Quincy, the Nickel Plate and several others. These are all large corporations. Why shouldn't they be included in a motion of this kind?

MR. WILDER—I do not see that my motion conflicts in any way whatever with the resolution passed. These have been found to work, although we do not consider that they are mechanically correct in all their principles. And as you said, these people are looking to us to recommend something. There is one of these draw-bars that we consider mechanically correct in detail. For

that reason I do not see why we should not recommend a trial of the draw-bars mentioned.

MR. ADAMS—I would move, as a substitute for Mr. Wilder's motion, that we reduce that number to four, and that the four be the Archer, the Ames, the Wilson & Walker, and the Cowell.

Seconded.

MR. WILDER—I move that the Gifford be substituted for the Ames.

MR. BLACKALL—I do not think Mr. Wall's resolution was fully understood, and I move that it be reconsidered.

MR. McKENZIE—I voted for Mr. Wall's resolution. I did not understand that it consisted of a hook coupler at all.

MR. WILDER—I raise the point of order that the question before the house is on the resolution offered.

MR. CLOUD—I think that some of the members are mixed 'on the idea of hooks. Hooks may be worked on a horizontal plane, and may work up and down, or hooks may work on a vertical plane and couple, and it is not at all the scope, as I understand it, of the resolution which was passed to include hooks which work on a pin.

MR. TOWNSEND—I offer, as an amendment, to include the Janney in Mr. Adams' motion.

Seconded.

MR. ADAMS—I will accept that if they will allow me to take out one of the other couplers. I will take out the Archer.

THE PRESIDENT—The seconder would have to agree to that, and then I think the Chair would rule it out of order. The question would now be on the amendment to the substitute which was offered by Mr. Townsend.

MR. WILDER—I move to lay the substitute on the table.

Seconded.

MR. WALL—Mr. Marden has said that these couplers will not couple automatically with those now in use. Consequently the motion is in order.

The motion to lay on the table the substitute as amended by Mr. Townsend was lost.

MR. ADAMS—If I understand Mr. Wilder he wants to give these couplers a chance to show their merits, to have a trial before the country and before the railroad men of the country, and I am willing to put it on that ground. If the Janney and the Cowell are the best, they are the couplers we want; and if the others are the best, the others are what we want. Now, the ground we have taken against those couplers is simply that they are dangerous to us with reference to their coupling cars. They are an effectual and practical coupler in every way, and couple first rate. But we considered them as dangerous to life in coupling the present system. I do not question the superior mechanism in it. The very thing that the public and the railroad commissioners and the legislatures have in mind is to obviate that danger to life. Now, we are going forward to adopt a coupler that for the next ten years will endanger more lives than ever before.

MR. MARDEN—I cannot agree with our friend Adams. I think the time is rapidly coming when we shall be obliged to put on dead-blocks, and with that protection I cannot see why a hook coupling is going to be very much more dangerous than another coupling.

There is another thing I would like to call your attention to, and that is that

the Committee have been criticised for not recommending one or two draw-bars. You can see readily what criticism your committee would have been visited with had they recommended one or two draw-bars. The friends of the other draw-bars would never have forgiven them, nor, I suppose, ever have spoken to them afterwards.

MR. CLOUD—I would move the substitution of the following resolution for the whole matter:

Resolved, That the Convention recommends to any railroads wishing to experiment with couplers not belonging to the most mechanically perfect class, as Janney's or Cowell's, to experiment with the following: The Archer, Ames, United States, Mitchell, Wilson & Walker, Conway Ball, and Gifford.

Mr. Blackall seconded the resolution, and the question was put.

MR. ADAMS—I move, as a substitute, that we strike out three or four of those names.

MR. WILDER—I rise to the point of order that a substitute cannot be offered while a vote is being taken.

The point was sustained, and Mr. Cloud's motion was carried unanimously.

MR. WILDER—I move that the resolution foreshadowed by Mr. Keeler to appoint an expert to examine into this subject of car couplers in conjunction with the railroad commissioners be passed.

Seconded.

MR. FORNEY—Before this question is put, I wish to say that the investigation which is proposed will involve a great deal of labor, a large outlay of time, and very considerable expense. I would not like to undertake such an outlay of time and money without knowing more definitely what I would be expected to do. To be started out on a roving commission to investigate car-couplers is rather a wild task. The members ought to state a little more explicitly what it is that they want to have done.

MR. ADAMS—I had in mind a little humanity when I reduced that to four. I knew Mr. Forney would never go through all those couplers and give them a full examination.

THE PRESIDENT—Would it not be as well to qualify that motion—to put it in the form of a request, that the railroad companies should employ Mr. Forney to do this?

Mr. CLOUD—I am opposed to the motion as it stands. Not that I do not know that Mr. Forney would give us a very valuable and able report if he had the facilities; but I do not think that he nor anybody else can control the necessary facilities. I think that the way the matter now stands, we shall probably be able to work more nearly together in one line, provided the members of the Convention, if they have any experiments to make on self-couplers, heed the recommendations of this meeting. And inasmuch as we have no fund at our disposal, at the present time, to pay adequately for such a service as this, it seems to me we ought not to pass this resolution in this shape. If it could be modified in some such way as to recommend railroads to employ some one, and recommend that that man be Mr. Forney, then we could leave it, and if Mr. Forney were employed by any of the railroads he would be paid by them, of course, and be compensated for his work.

MR. WILDER—I would be pleased to accept the amendment if he would so word it as to request the railroad companies to make arrangements with Mr.

Forney to examine into this matter of draw-bars, in conjunction with the railroad commissioners of the different States, and to report to this Convention.

MR. MARDEN—I do not know that I look at the matter, perhaps, in the right light, but it seems to me we are not doing ourselves justice by any such resolution. I think the expert ought to be the representative of the Association. I do not think that we can raise the money to pay for experiments, but I do not doubt but that if the railroads were called upon to contribute to any experiments suggested by Mr. Forney, that the money would be forthcoming. I think the railroads would much prefer to leave the matter in the hands of the master car-builders. I certainly would vote for the resolution appointing Mr. Forney the expert of the Association, and trust to the future for funds and supplies and means of carrying out the experiments we wish to make.

MR. WILDER—After consultation with Mr. Forney and Mr. Cloud I withdraw the resolution I offered, and offer another resolution, if there is no objection, which would be that a committee of five be appointed to inquire into the expediency of appointing an expert to examine car-couplers, and report to this Convention.

MR. C. E. GAREY—I would move as a substitute for the committee of five, that it be referred to the Executive Committee for the same purpose.

Seconded.

MR. SOULE—I will offer a second substitute, if it is in order:

Resolved, That the Executive Committee be instructed to issue a circular to all the railroad companies represented in this Association setting forth our plan of retaining Mr. M. N. Forney to devise, conduct and record, tests of automatic freight-car couplers, and asking them to signify their willingness to sustain their pro-rata proportion of all expenses incident to such tests.

MR. WILDER—I will accept that as a substitute to the original motion.

MR. FORNEY—I would like to offer as a further amendment to Mr. Soule's substitute—that my name be stricken out, and it stand simply expert.

MR. SOULE—That amendment is not entirely acceptable to me, because I think Mr. Forney's name in connection with the substitute would secure favorable results. (Applause.)

Mr. Soule's substitute was carried unanimously.

The report of the Committee on Resolutions was read and adopted.

REPORT OF COMMITTEE ON RESOLUTIONS.

Your Committee recommend the adoption of the following resolutions:

Resolved, That this Association unite in tendering their thanks to the New York Central and Hudson River Railroad Company, the Boston and Albany Railroad Company, the New York Central Sleeping Car Company, the Boston, Hoosac Tunnel and Western Railroad Company, and the proprietors of Congress Hall for courtesies extended to its members during this the Eighteenth Annual Convention of the Association.

Resolved, That the organization also tenders its thanks and

hearty commendation to the officers and managers of the Delaware and Hudson Canal Company for the extreme kindness and generosity paid this body during our present meeting.

And be it further resolved, That copies of the foregoing be forwarded by the Secretary to the officers of the companies referred to.

JAS. T. LEIGHTON,
S. P. ENSIGN, } *Committee.*

MR. BISSELL—There is one more matter I think we should take up, and that is that we tender a vote of thanks to Mr. M. N. Forney, for the very able and exhaustive report on car wheels that was read yesterday. I would like to have this spread on the record as a slight recognition of the very able paper of our worthy secretary.

Carried unanimously.

MR. FORNEY—I suppose I ought to say something. It seems a little unkind, perhaps, that when a member does a bit of work, like the paper which you did me the honor to listen to, that you should then make him uncomfortable by passing such a resolution as this. I appreciate your compliment very highly, and it certainly is a very satisfactory reward for the time and trouble I bestowed upon that paper.

The report of the Committee on Nominations was read.

REPORT OF COMMITTEE TO NOMINATE OFFICERS FOR THE ENSUING YEAR.

The Committee appointed to make nominations for officers for the ensuing year would respectfully report the following names:

For President, Leander Garey,

For First Vice-President, Wm. McWood,

For Second Vice-President, J. W. Cloud,

For Third Vice-President, B. K. Verbryck,

For Treasurer, John Kirby.

Executive Members, F. D. Adams, Joseph Townsend, G. W. Rhodes.

Respectfully submitted,

J. N. LAUDER,
SANFORD KEELER,
W. F. TURREFF,
JOSEPH WOOD,
J. TOWNSEND, } *Committee.*

Mr. Rhodes' name was, at his request, withdrawn from the list of candidates and Mr. Wall's name was substituted.

It was agreed that the Secretary be authorized to cast the vote of the Association for the persons nominated, which he did.

MR. FORNEY—I move that Mr. Adams be appointed a committee to conduct the President back to his chair.

Mr. Adams conducted Mr. Garey to his seat, and he was received with applause and a speech was called for.

PRESIDENT GAREY—I can say nothing, I assure you, that will express my feelings on this occasion. I suggested to the Committee to Nominate Officers, that they select some one to relieve me from the responsibility and duty that you have assigned to me for so many years. I feel grateful to you all for the courtesy that you have shown me, and for your indulgence in regard to the errors which I have committed while presiding over your deliberations. During my stay with you, I will do the best I can, but next year I will make it a request that you will select some one who can fill the chair more ably than I, and divide the honors somewhat among the members of the Association. (Applause.)

The President called for the report of the Committee on Subjects.

MR. WALL—Mr. Forsyth, who is Chairman of that Committee, asked me to make the report. We would like to ask the Convention to permit us to report the subjects to the Executive Committee in a short time. Of course, there are at each Convention a number of subjects which come up for discussion which are not completed or else are hinted at and should give rise to new subjects for the following year. We therefore cannot prepare a report beforehand. We have to prepare it after we have deliberated on what has been said. I would therefore ask that we be permitted to report the subjects to the Executive Committee and they can prune them down and select the Committee and say what shall be reported on next year.

THE PRESIDENT—If there is no objection the request is granted.

MR. KIRBY—I would make a request of that Committee that they select as few topics for discussion as possible, in order that we may give them a free and full discussion. We saw the importance of that this morning when we called up the truck matter again. Ordinarily we just pass over the surface, but when we come to remove the surface, we find there is a good deal below that needs investigating. If we have only a few subjects to talk about we will talk more fully upon them.

MR. BISSELL—If any members of the Association have any subjects on their mind, I wish that they would report such facts to Mr. Forsyth.

The Convention then adjourned to meet at the Hygeia Hotel, Fortress Monroe, on the second Tuesday in June, 1885.

The following report was received after the adjournment of the Association:

REPORT OF THE COMMITTEE ON SUBJECTS FOR DISCUSSION NEXT YEAR.

To the Executive Committee of the Master Car-Builders' Association:

Your Committee on Subjects for Investigation and Discussion at the Next Annual Meeting, beg leave to make the following report:

In accordance with the action taken at the last Annual Convention, the following Committees are to be continued:

First—"Standard Freight Car Trucks"—Messrs. Miller, McWood and Forsyth. Two additional members to be added.

The subject of this Committee originally included Passenger Car Trucks. This portion of the subject, however, at the request of Mr. Miller, the Chairman, is to be left off.

Second—"Brake Shoes, Brake Beams, and Interchangeable Parts of the Brake Arrangement of Cars."

Committee continued, with instructions to submit a definite form of brake shoe, brake beam and of interchangeable parts, for adoption at the next Annual Convention.

Third—"Standard House Car to carry 60,000 Pounds Lading."

This Committee to be united with the Committee on "Freight Car Framing and Trussing," with instructions to report on a definite form of framing and trussing, for adoption at the next Annual Convention.

Fourth—"Standards and Appliances for the Safety of Trainmen."

Committee continued.

Fifth—"Passenger Car Framing and Trussing."

Committee continued.

Sixth—"Automatic Freight Car Couplers."

No action was taken at the Convention with reference to the discharging of this Committee. We think, however, it is a subject that the Executive Committee should take action upon, with reference to the employment of Mr. Forney as an expert.

Seventh—"Automatic Freight Car Brakes."

Subject continued and the Committee discharged. A new Committee to be appointed, taken from those roads that have had some experience with automatic freight car brakes.

Eighth—"Freight Car Roofs."

Committee continued.

Ninth—"Side Dumping and Drop Bottom Coal Cars."

Committee continued.

Tenth—" Committee to Report at the Next Annual Convention, Subjects for Investigation and Discussion."

A new committee should be appointed.

Eleventh—" Committee on Arrangements for the next Annual Convention to be held at Fortress Monroe."

A new committee should be appointed.

We would recommend to your consideration subjects worthy of investigation and discussion as follows:

1. " The maximum and minimum limit gauge for receiving-cars." This is in accordance with the second recommendation contained in Mr. Forney's paper on " Relation of Railroad Wheels and Rails to Each Other."

2. " A standard axle for cars ranging from 40,000 to 60,000 lbs. capacity."

3. " The comparative advantages of the two methods of constructing freight cars, with and without platform timbers, or end sills projecting from the end of the car." There is a great diversity of opinion and practice among master car-builders as to the advantages of these different forms of construction. We think it would be well for the Association to have these opinions clearly stated by a committee. A careful investigation of the subject might lead to a greater uniformity of practice. The present differences in construction determine very largely the form of draft rigging, and also several details of any automatic couplings which we may be called upon in the future to adopt. We think there should be on the committee representatives of both the present practices.

All of which is respectfully submitted.

EDWD. B. WALL,
T. A. BISSELL, } *Committee.*

LETTER BALLOTS.

In accordance with the resolution on pages 31, 95–99, 119 and 120 of the Eighteenth Annual Report, and with the provisions of Article IX. of the Constitution, the Secretary sent the following circular and blank ballot to each member of the Association:

CIRCULAR RELATING TO LETTER BALLOTS.

NEW YORK, July 19, 1884.

DEAD-BLOCKS.

Sir:

At the last Annual Convention held in Saratoga, in June, it was resolved:

"That the distance, 12 in., between dead-blocks, recommended at the Sixteenth Annual Convention, be changed to 14 in., that the length over all be changed from 28 to 30 in., and the distance from centre to centre be 22 in., instead of 20."

These changes are shown in Figures 71 and 72, page 175.

The Executive Committee has decided that section 1, article IX. of the Constitution makes it necessary to submit this resolution to a letter ballot for the approval of members before it is finally adopted. Please indicate by writing "yes" or "no" after the *first* question on the back of the enclosed postal card, whether or not you are in favor of the adoption as a standard of the proposed change in the dimensions of dead-blocks.

STANDARD AXLE.

At the same session of the Master Car-Builders' Association it was proposed to increase the diameter of the Master Car-Builders' Standard Axle in the middle from $3\frac{7}{8}$ in. to $4\frac{1}{4}$ in. A resolution was adopted to refer the proposed change to the members for approval by letter ballot.

In Plate IX. the dotted lines represent the shape and size of the axle between the hubs of the wheels as adopted some years ago; the full lines show the alterations. Please indicate by writing "yes" or "no" after the *second* question on the back of the inclosed postal card whether you are in favor or not in favor of the adoption as a standard of the proposed changes in the size of the Master Car-Builders' Standard Axle.

SYSTEM OF LETTERING AND NUMBERING FAST FREIGHT LINE CARS.

A system of lettering and numbering cars was also proposed at the meeting referred to, and it was decided to submit it for approval by letter ballot.

The following resolutions were adopted, which, with Figs. 75, 76 and 77, page 179, describe the proposed system of lettering and numbering "Fast Freight Line" cars:

1st. The half of sides of car on which the doors do not slide, to show the name of the "Fast Freight Line" (spelled out in full) and the car number (in the Fast Freight Line series) immediately below it. In the same panel and within two feet of the sill shall appear (in letters not over four inches high) the name of the railroad company owning or contributing the car, and between the same and the sill shall appear the light weight of the car, with such other information as it is found advisable to give in connection with same.

2d. The doors should have no marks whatever.

3d. The ends to show the initials of the "Fast Freight Line" with the car number (in the Fast Freight Line series) and the light weight just below them; no other marks will appear on ends of car.

4th. The half of sides of cars on which the doors do slide, to be reserved for advertising symbols or trade-marks where used. The use of profuse lettering in this panel is to be discouraged, however, and it is recommended that only the simplest trade-marks or advertising signs should be used; the capacity of the car to appear near the sill in this same panel.

Please indicate, by writing "yes" or "no" after the *third* question on the back of the inclosed postal card, whether or not you are in favor of the adoption as a standard of the proposed system of lettering and numbering "Fast Freight Line" cars.

SYSTEM OF LETTERING AND NUMBERING BOX-CARS NOT IN FAST FREIGHT LINE SERVICE.

The same Committee also submitted a system for lettering and numbering all other box-cars (not in Fast Freight Line service), which the Association decided to submit to letter ballot for approval. This system is described in the following resolutions:

1st. The half of sides of cars on which the doors do not slide, to show the name of the railroad company, with the car number immediately below it; it is preferable that the name of the railroad company should be spelled out in full; where this is not done, however, it is urged that immediately under the car number should appear, in small letters not over four inches high, the name of the owning or contributing road spelled out in full; the light weight of car, with such other information as it is necessary to give in same connection, to appear near the sill and in the same panel.

2d. The doors of the car to have no marks whatever.

3d. The ends of the car to show the initials of the railroad with car number and light weight below them. No other marks to appear on ends of car.

4th. The half of sides of car on which the doors do slide to have no marks whatever (except in case of local freight lines, which may be referred to in this panel), except, of course, the capacity marks, which will be near the sill and in same panel.

Please indicate, by writing "yes" or "no" after the *fourth* question on the back of the inclosed postal card whether or not you are in favor of the adoption as a standard of the proposed system of lettering and numbering *all box cars* (not in Fast Freight service), and then mail the card to

M. N. FORNEY, Secretary,
71 Broadway, New York.

The following is a copy of the postal cards which were used for ballots:

LETTER BALLOT OF THE MASTER CAR-BUILDERS' ASSOCIATION.

New York, July 19th, 1884.

Sir: Please indicate by writing "YES" or "NO" after each of the following questions whether or not you are in favor of the adoption of the measures to which they refer, and then sign your name below and remail the card to the Secretary.

1. Are you in favor of the adoption as a standard of the proposed changes in the dimensions of dead-blocks described in the circular herewith? (Write YES or NO here) ☞

2. Are you in favor of the adoption as a standard of the proposed changes in the dimensions of the Master Car-Builders' Standard Axle described in the circular herewith? (Write YES or NO here) ☞

3. Are you in favor of the adoption as a standard of the proposed system of lettering and numbering cars in "Fast Freight Line" service described in the circular herewith? (Write YES or NO here) ☞

4. Are you in favor of the adoption as a standard of the proposed system of lettering and numbering all box cars not in "Fast Freight Line" service described in the circular herewith? (Write YES or NO here) ☞

(Sign your Name here) ☞ .....

Number of votes to which member is entitled .....

Tabulated Statement of Votes Cast by Letter Ballot.

Name of Member.	Questions Voted On.							
	1		2		3		4	
	Are you in favor of the adoption as a standard of the proposed changes in the dimensions of dead-blocks described in the circular?		Are you in favor of the adoption as a standard of the proposed changes in the dimensions of the Master Car Builders' Standard Axle described in the circular?		Are you in favor of the adoption as a standard of the proposed system of lettering and numbering cars in "Fast Freight Line" service described in the circular?		Are you in favor of the adoption as a standard of the proposed system of lettering and numbering all box cars not in "Fast Freight Line" service described in the circular?	
	Votes Cast.		Votes Cast.		Votes Cast.		Votes Cast.	
	Yes.	No.	Yes.	No.	Yes.	No.	Yes.	No.
Adams, F. D	..	7	7	..	..	7	..	7
Aylesbury, Thos	1	..	1	..	1	..	1	..
Baker, D. H	1	..	..	1	1	..	1	..
Billings, Sam'l D	..	1	1	..	..	..	..	1
Bissell, T. A	1	..	1	..	1	..	1	..
Blackall, R. C	..	11	..	11	11	..	11	..
Blackwell, Charles	4	..	..	4	..	4	..	4
Briggs, R. H	1	..	1	..	1	..	1	..
Brownell, F. G	1	..	1	..	1	..	1	..
Canham, H	..	..	3	..	3	..	3	..
Chamberlain, E	1	.	1	..	1	..	1	..
Chamberlain, J. T	..	1	1	..	..	1	..	1
Chamberlain, W. E	1	..	1	..	1	..	1	..
Chapman, T. L	..	7	7	..	..	..	..	7
Cloud, John W	48	..	48	..	48	..	..	48
Cooper, H. L	..	1	1	..	..	1	..	1
Coulter, J. P	3	..	3	..	..	..	3	..
Cushing, G. W	10	..	10	..	10	..	10	..
Davenport, W. R	1	..	1	..	1	..	1	..
Divine, John P	1	..	1	..	1	..	..	1

Name of Member.	Questions Voted On.							
	1		2		3		4	
	Are you in favor of the adoption as a standard of the proposed changes in the dimensions of dead-blocks described in the circular?		Are you in favor of the adoption as a standard of the proposed changes in the dimensions of the Master Car-Builders' Standard Axle described in the circular?		Are you in favor of the adoption as a standard of the proposed system of lettering and numbering cars in "Fast Freight Line" service described in the circular?		Are you in favor of the adoption as a standard of the proposed system of lettering and numbering all box cars not in "Fast Freight Line" service described in the circular?	
	Votes Cast.		Votes Cast.		Votes Cast.		Votes Cast.	
	Yes.	No.	Yes.	No.	Yes.	No.	Yes.	No.
Donaby, R.	1	..	1	..	1	..	1	..
Duncan, T. G.	1	..	1	..	..	1	..	1
Ensign, S. P.	1	..	1	..	..	1	..	1
Finlay, L.	1	..	1	..	1	..	1	..
Forsyth, Wm.	16	..	16	..	16	..	16	..
Fuller, Wm.	.	8	8	..	..	8	8	..
Garey, C. E.	1	..	1	..	1	..	1	..
Garey, Leander.	33	..	33	..	33	..	33	..
Geffcken, E.	1	..	1	..	1	..	1	..
Goodwin, H. Stanley.	19	..	19	..	..	19	..	19
Gramling, Geo. H.	1	..	1	..	1	..	1	..
Greenland, Thos.	..	1	1	..	..	1	..	1
Hackney, Geo.	..	..	1	..	..	1	..	1
Haines, S. W.	..	2	2	..	2	..	2	..
Hall, J. K.	..	1	1	..	1	..	1	..
Helfrich, H. J.	3	..	3	..	3	..	3	..
Henney, John, Jr.	4	..	4	..	4	..	4	..
Henney, J. B.	..	..	1	..	1	..	1	..
Hill, C. H.	1	..	1	..	1	..	1	..
Hill, John.	1	..	1	..	..	..	..	
Hitchcock, R.	1	..	1	..	1	..	1	..
Hodge, John.	1	..	1	..	1	..	1	..
Hoit, D.	1	..	1	..	1	..	1	..

Name of Member.	Questions Voted On.							
	1		2		3		4	
	Are you in favor of the adoption as a standard of the proposed changes in the dimensions of dead-blocks described in the circular?		Are you in favor of the adoption as a standard of the proposed changes in the dimensions of the Master Car-Builders' Standard Axle described in the circular?		Are you in favor of the adoption as a standard of the proposed system of lettering and numbering cars in "Fast Freight Line" service described in the circular?		Are you in favor of the adoption as a standard of the proposed system of lettering and numbering all box cars not in "Fast Freight Line" service described in the circular?	
	Votes Cast.		Votes Cast.		Votes Cast.		Votes Cast.	
	Yes.	No.	Yes.	No.	Yes.	No.	Yes.	No.
Hovey, J. P	4	..	4	..	4	..	..	..
Keeler, Sanford	3	..	3	..	3	..	3	..
Kirby, John	..	17	17	..	17	..	17	..
Lauder, J. N	3	..	3	..	3	..	3	..
Lee, Israel	..	1	1	..	1	..	1	..
Lentz, John S	5	..	5	..	..	5	..	5
Lyons, H. D	2	..	..	2	2	..	2	..
McCarty, H. C	1	..	1	..	1	..	1	..
Mackenzie, John	..	8	8	..	8	..	8	..
McGee, James	3	..	3	..	3	..	3	..
McIlwain, J. D	6	..	..	..	..	..	..	..
McKenna, Robert	24	..	24	..	24	..	24	..
McWood, W	1	..	1	..	1	..	1	..
Mileham, J	..	1	1	..	1	..	1	..
Miller, Robert	11	..	..	11	..	11	11	..
Minshull, E	1	..	1	..	1	..	1	..
Moore, John C	..	1	1	..	1	..	1	..
Murray, S. W	1	..	1	..	1	..	1	..
Ortton, John	1	..	1	..	1	..	1	..
Peabody, D. B	..	1	1	..	1	..	1	..
Potts, Robert	1	..	1	..	1	..	1	..
Ramseyer, W. H	..	1	1	..	1	..	..	1
Rommel, George	1	..	..	1	1	..	1	..

Name of Member.	Questions Voted On.							
	1		2		3		4	
	Are you in favor of the adoption as a standard of the proposed changes in the dimensions of dead-blocks described in the circular?		Are you in favor of the adoption as a standard of the proposed changes in the dimensions of the Master Car-Builder's Standard Axle described in the circular?		Are you in favor of the adoption as a standard of the proposed system of lettering and numbering cars in "Fast Freight Line" service described in the circular?		Are you in favor of the adoption as a standard of the proposed system of lettering and numbering all box cars not in "Fast Freight Line" service described in the circular?	
	Votes Cast.		Votes Cast.		Votes Cast.		Votes Cast.	
	Yes.	No.	Yes.	No.	Yes.	No.	Yes.	No.
Smith, C. H	..	1	1	..	1	..	1	..
Snow, W. B	9	..	9	..	..	9	..	9
Soule, R. H	6	..	6	..	..	6	..	6
Sutherland, Thos	..	..	3	..	3	..	3	..
Sweeney, John	1	..	1	..	1	..	1	..
Taylor, G. M	..	1	1	..	1	..	1	..
Taylor, Joseph	..	..	1	..	1	..	1	..
Townsend, J	9	..	9	..	9	..	9	..
Trainham, Wm. H	1	..	1	..	1	..	1	..
Van Buskirk, W. G	..	1	..	1	1	..	1	..
Verbryck, B. K	8	..	8	..	8	..	..	8
Voorhees, John	..	..	1	..	1	..	1	..
Wall, Edward B	11	..	11	..	11	..	..	11
Wallis, Herbert	17	..	17	..	..	17	..	17
Watrous, George C	2	..	2	..	2	..	2	..
Wilder, F. M	..	32	..	32	32	..	32	..
Wilder, Milton	..	1	1	..	..	1	..	1
Total votes cast	293	106	340	63	298	93	247	151

All the questions submitted for decision by letter ballot were adopted, excepting the fourth, which relates to the "lettering and numbering of all box cars not in 'Fast Freight Line' service." This did not receive two-thirds of the votes cast, and, therefore, was not adopted by the Association as a standard.

MINUTES OF THE MEETINGS OF THE EXECUTIVE COMMITTEE OF THE MASTER CAR-BUILDERS' ASSOCIATION.

MINUTES OF MEETING HELD IN THE ROOMS OF THE CAR-BUILDERS' CLUB, No. 113 LIBERTY STREET, NEW YORK, May 6, 1884.

There were present Messrs. Garey, Marden, Cloud and Packard. Mr. Lentz came in after the meeting had organized for business. The minutes of the meeting which was held on June 14, 1883, were read and approved. Letters from Mr. J. C. Terry, dated November 15 and 22, relating to his eligibility for active membership in the Association, were read, and the Committee decided that under the constitution he was not eligible, and the Secretary was instructed to write to him informing him of their decision.

The Secretary submitted a draft of a report of the Executive Committee, to be made in accordance with the resolution adopted at the last annual convention and printed on page 97 of the annual report, by which the Committee was instructed to revise the resolution relating to recommendations of standards. The report as adopted by the Committee, is printed in the Eighteenth Annual Report, pages 14–28.

The Secretary submitted a draft of a circular and blank appointment to be sent to the general managers and general superintendents of railroads, who have not appointed representative members to the Association, inviting them to do so. The Secretary was instructed to have the circular printed and sent to those officers for whom it was intended.

The Secretary submitted a draft of another circular, announcing the next annual convention, and a blank application for active membership, the latter to be sent to all persons who are eligible for active membership, and who have not yet joined the Association. The Secretary was instructed to have this circular printed and sent to the persons for whom it was intended.

Another circular, and blank postal-card, requesting representative members to send the Secretary the number of cars owned by their companies before the next annual convention, was submitted and ordered printed.

The Secretary requested that the following appropriations be made for expenses incurred by him: $25.40 for stationery, $52 for postage, $240 for reporting last meeting, $498 for paper and printing last annual report, $76.50 for printing circulars

since last annual convention, $69.29 for engraving, 40 cents for express charges—making a total of $962.16. The appropriations were authorized by the Committee.

The retail price of the late large annual reports, to persons who are not members of the Association, was fixed at one dollar per copy, and that of the early small ones at fifty cents.

The letter ballots on the adoption of standard limit gauges for round bar-iron and a standard wheel-gauge and form of section for the flanges and treads of car-wheels, which were sent out by the Secretary in November last, were approved by the Committee.

On motion of Mr. Lentz, the Secretary was instructed to write to the Chairman of the Committee of Investigation to open the discussion of the reports to be submitted at the next annual meeting.

A letter from Mr. Goodwin was read, dated April 28, in response to one from the Secretary, asking whether the Committee on a Standard Box-car to carry 60,000 lbs. of Lading, would be ready to report to the Executive Committee, in which he stated that his committee was not yet ready to report.

The Secretary was instructed to issue a circular inviting all the railroad companies in North America to send representatives of the permanent way departments to meet the Master Car-Builders at their next annual convention, for a joint discussion of the gauge and form of rails, and gauge of wheels and form of wheel-treads and flanges, with a view to recommending standards for both.

The Committee then adjourned.

M. N. FORNEY, Secretary.

MINUTES OF MEETING OF THE EXECUTIVE COMMITTEE HELD IN CONGRESS HALL HOTEL, SARATOGA SPRINGS, N. Y., JUNE 9, 1884.

There were present Messrs. Garey, Marden, Cloud, Lentz, McWood, Miller.

The minutes of the meeting held May 6, 1884, were approved. The annual assessment of dues was fixed at $5 per vote. The Secretary was instructed to furnish to parties who applied for it a copy of a report of Committee on Automatic Car-Couplers, which has not heretofore been published.

The Report of the Committee on Automatic Brakes for Freight Cars was submitted to the Executive Committee. Mr.

Marden moved that the report be referred back to the committee with the request that the portion which refers to the Westinghouse Brake be omitted. The motion was passed.

On motion of Mr. Cloud, appropriations were made for the following expenses incurred by the Secretary: Postage, $26.00; stationery, $5.15; printing circulars, $39.25.

Mr. Lentz moved that the Executive Committee recommend to the Association that the annual dues of Mr. David H. Baker and Mr. J. Lightner be remitted. The motion was approved.

Mr. Marden moved that the Executive Committee recommend to the Association that a resolution be passed instructing the Secretary to post the names of all members in arrears for dues, with the amount of their indebtedness, in the meeting-room of the annual conventions hereafter to be held, due notice to be mailed to delinquent members of their indebtedness at least sixty days before the meeting of the Association, with a copy of this resolution. Mr. Marden's motion was adopted.

On motion of Mr. Lentz, the Secretary was instructed not to furnish any reports of committees to any one until they are read before the Association.

On motion of Mr. Marden, the communication from the Railroad Commission of the State of New York, in relation to doors in the roofs of cars, was referred to the Association for discussion.

The Committee then adjourned.

M. N. FORNEY, Secretary.

MINUTES OF MEETING OF THE EXECUTIVE COMMITTEE HELD IMMEDIATELY AFTER THE CLOSING OF THE EIGHTEENTH ANNUAL CONVENTION IN CONGRESS HALL HOTEL, SARATOGA SPRINGS, NEW YORK, JUNE 12.

The President, Mr. Leander Garey, called a meeting of the Executive Committee. Mr. Edward B. Wall was appointed Secretary of the meeting. All of the members of the Executive Committee and the officers of the Association, with the exception of the regular Secretary, were present. The President stated that the business of the meeting would be the election of a Secretary for the Association during the ensuing year. The name of Mr. M. N. Forney was proposed, and he was unanimously elected.

Motion for adjournment was then made and carried.

EDW'D. B. WALL, Secretary *pro tem.*

STANDARD DIMENSIONS, FORMS OF CONSTRUCTION, ETC., ADOPTED BY THE MASTER CAR-BUILDERS' ASSOCIATION.

WHEELS AND AXLES.

Width of Wheel-Tread.

The standard width of wheel-tread, recommended at the Sixteenth Annual Convention, held in Philadelphia in 1882 (*see page* 179 *of Report for that year*), is $5\frac{1}{2}$ in., measured from outside of tread to inside of flange.

Diameter of Chill-Molds for Car-Wheels.

The standard diameter for chill-molds, recommended at the Sixteenth Annual Convention, held in Philadelphia in 1882 (*see pages* 178 *and* 179 *of that year*), for 33-in. wheels is $33\frac{1}{2}$ in. at the point indicated in Fig. 58, and for 30-in. wheels $30\frac{3}{8}$ in.

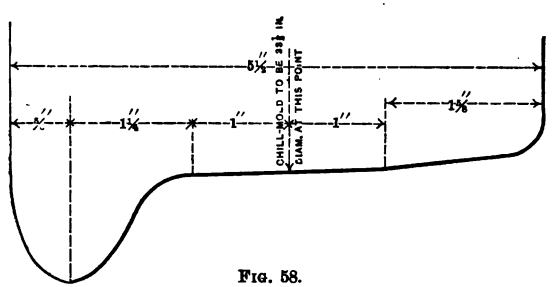


Fig. 58.

Distance between the Backs of the Flanges of Car Wheels.

The standard distance between the backs of the flanges of car-wheels as indicated at A, Fig. 59, is 4 feet $5\frac{3}{8}$ inches.

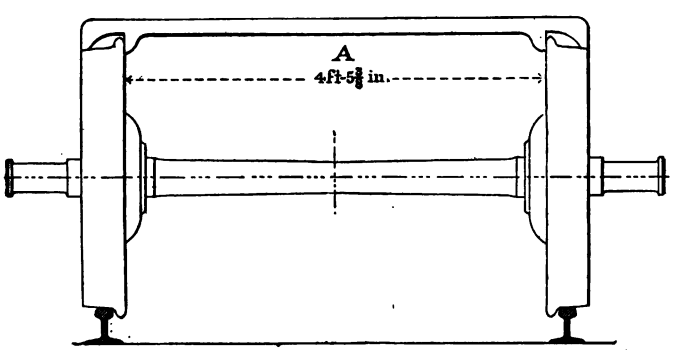


Fig. 59.

This distance was proposed in a resolution adopted at the Seventeenth Annual Convention, held in Chicago in 1883 (*see page 55 of the Report of that meeting*), and was afterwards submitted to and approved by a letter ballot (*see pages* 118–120 *of Seventeenth Annual Report*).

Wheel and Axle Gauges.

At the Sixteenth Annual Convention, held in Philadelphia in 1882 (*see page* 197 *of Report for that year*), it was

"*Resolved*, That the sense of this meeting is that all the gauges recommended by the Committee on Wheel Gauge should be in use in all repair and car building shops of every equipment."

These gauges are shown in Plate VIII.

Boring Wheels.

At the Seventeenth Annual Convention (*see page 57 of the Report*) a resolution was adopted recommending that six dogs be used for centering wheels when they are bored.

Standard Axle.

At the Annual Convention held in Boston in 1873, a standard for car-axles was recommended, the form and dimensions of which, excepting the diameter in the middle, were substantially the same as those shown in Plate IX. (*For other action, with reference thereto, see Tenth Annual Report, page* 99; *Twelfth Annual Report, page* 129; *and Thirteenth Annual Report, page* 103.) The dimensions shown in Plate IX., with the exception of the diameter in the middle, were adopted by both the Master Car-Builders' and American Railway Master Mechanics' Association, after a conference of committees appointed by each Association. (*See Fourteenth Annual Report, page* 130.)

At the Convention held in Saratoga in 1874, it was proposed to increase the diameter of the standard axle in the middle, from $3\frac{7}{8}$ in. to $4\frac{1}{4}$ in. A resolution was adopted to refer the proposed change to the members of the Association for approval by letter ballot. It was so referred (*see pages* 156–162 *of this Report*), and more than two-thirds of the votes cast were in favor of increasing the diameter in the middle to $4\frac{1}{4}$ in. This change has therefore been adopted, and Plate IX. represents the standard axle, as modified by this action of the Association.

JOURNAL-BEARING, JOURNAL-BOX AND PEDESTAL.

Journal-Bearing.

Plates X., XI., and XII. represent the standard for journal-bearings, journal-boxes, and pedestals, recommended at the Eighth Annual Convention, held in Cincinnati in 1874. (*See page* 40 *of Report for that year.*) This action was reaffirmed at the Fifteenth Annual Convention, held in New York in 1881. (*See pages* 14, 15 *and* 27 *of Report for that year.*)

SCREW THREADS.

What is known as the Sellers' or Franklin Institute System of Screw-threads, Bolt-heads and Nuts was recommended as a standard at the Fifth Annual Convention, held in Richmond, Va., in 1872. (*See pages* 18 *and* 21 *of the Report of that meeting. See also pages* 82 *and* 83 *of Report of Thirteenth Annual Convention.*)

This system was proposed by Mr. William Sellers and was described by him in an essay read before the Franklin Institute of Philadelphia, April 21, 1864. In that essay the system is described as follows:

"The proportions for the proposed thread and its comparative relation to the sharp and rounded threads, will be readily understood from the accompanying diagram, in which Figs. 60 and 61—the latter on an exaggerated scale—represent a sharp thread, Figs. 62 and 63 a rounded top and bottom to the English proportions, and Figs. 64 and 65 the flat top and bottom, all of the same pitch. The angle of the proposed thread is fixed at 60°, the same as the sharp thread, it being more readily obtained than 55°, and more in accordance with the general practice in this country. Divide the pitch, or, which is the same thing, the side of the thread into eight equal parts, take off one part from the top and fill in one part in the bottom of the thread, then the flat top and bottom will equal one-eighth of the pitch; the wearing surface will be three-quarters of the pitch, and the diameter of screw at bottom of the thread will be expressed by the formula:

$$diameter - \frac{1.299}{number\ of\ threads\ per\ inch.}$$ "

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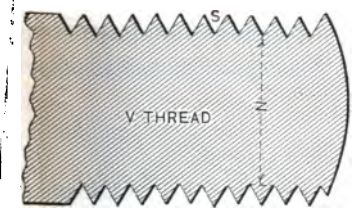

FIG. 60.

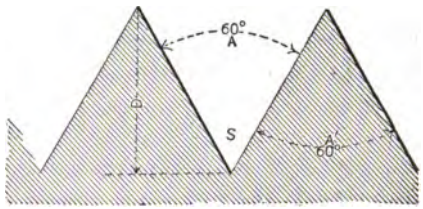

FIG. 61.

FIG. 62.

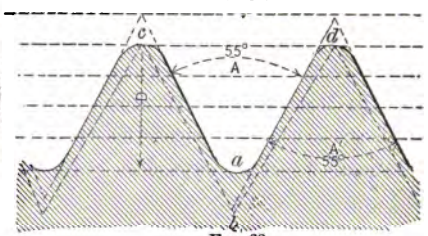

FIG. 63.

FIG. 64.

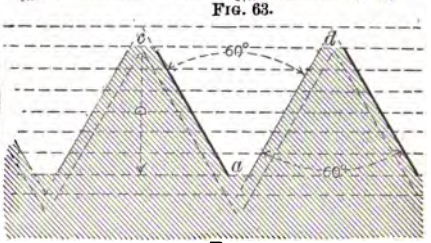

FIG. 65.

The table (herewith) is reprinted from Mr. Sellers' essay, and gives the proportions of his standard screw-threads, nuts and bolt-heads.

At the Sixteenth Annual Convention, held in Philadelphia in 1882 (*see page* 229 *of the Report of that meeting*), it was

"*Resolved*, That this Association deprecates the use of screws larger or smaller in diameter by a small fraction of an inch than the sizes specified for the Sellers or Franklin Institute system, and that all the members of the Association are urged to abandon entirely the use of over or under size screws."

At the same meeting the Committee on Standard Screw Threads was instructed (*see page* 229 *of the Report of that meeting*) "to procure a set of the unhardened gauges manufactured by the Pratt & Whitney Company, these to be kept among the archives of the Association, as the standard of measurement of screw-threads and for ultimate reference in case of need." The Committee was also instructed to get a standard two-foot rule.

The Committee procured the screw-gauges and rule and delivered them to the Association, at the adjourned meeting held at Niagara Falls in October, 1882.

Limit Gauges for Round Iron.

At the Seventeenth Annual Convention, held in Chicago in June, 1883, the following resolution was presented (*see pages* 37 *and* 38 *of the Report of that meeting*):

"*Resolved*, That the following sizes for limit gauges for round iron for the Sellers standard threads are hereby established by the Master Car-Builders' Association as the standard sizes for such gauges, and that it is recommended that round iron of the nominal standard sizes be made of such diameter that each one *will* enter the large or + end of the gauge intended for it, *in any way*, and will *not* enter the small or — end *in any way*.

Sizes of Limit Gauges for Round Iron.

Nominal diameter of Iron. Inches.	Large size. + end. Inches.	Small size. — end. Inches.	Total variation. Inches.
1/4	.2550	.2450	.010
5/16	.3180	.3070	.011
3/8	.3810	.3690	.012
7/16	.4440	.4310	.013
1/2	.5070	.4930	.014
9/16	.5700	.5550	.015
5/8	.6330	.6170	.016
3/4	.7585	.7415	.017
7/8	.8840	.8660	.018
1.	1.0095	.9905	.019
1 1/8	1.1350	1.1150	.020
1 1/4	1.2605	1.2395	.021 "

A motion to submit this resolution for decision by letter ballot

Fig. 66.

Fig. 67.

was adopted. On submitting it to the members more than two-thirds of the votes cast were in favor of the resolution (*see pages* 116–118 *of Seventeenth Annual Report*). It was, therefore, adopted, and the dimensions named are now the standard sizes of limit gauges for round iron. Fig. 66 represents the form of caliper gauge that was proposed, and Fig. 67 shows a cylindrical gauge to be used for testing the size of the caliper gauges.

DRAW GEAR.

Height of Draw-bars.

The standard height for draw-bars, which was recommended, or was intended to be recommended, at the Fifth Annual Convention, held in Richmond, Va., in 1872, is 2 ft. 9 in., measured perpendicularly from the tops of the rails to the centre of the draw-bar, when the car is empty. (*See pages* 42, 43, *and* 46 *of the Report of that meeting.** *See also Report of Thirteenth Annual Convention, pages* 108 *and* 109, *and Report of Eighteenth Annual Convention, page* 30.)

Attachments of Draw-Bars.

The method of attaching draw-bars at their rear ends, shown in Figs. 68, 69 and 70, was recommended at the Tenth Annual Convention, held in New York in 1876 (*see pages* 65 *and* 70 *of Report of that meeting*).

Dimensions of Draw-Bars.

The following were recommended as standard dimensions for draw-bars at the Thirteenth Annual Convention, held in Chicago in 1879 (*see pages* 96, 98, 108, *and* 109 *of Report of that year*).

The length *A* (*see Fig.* 69), from the end of head to the first follower-plate to be 28 in.

The depth (*B*) at outer yoke in carrying-plate to be 6 in.

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* There is evidently an error in the original report. It was Mr. Ford's amendment, and not Mr. Myers', which was adopted. The standard height recommended was 2 ft. 9 in.

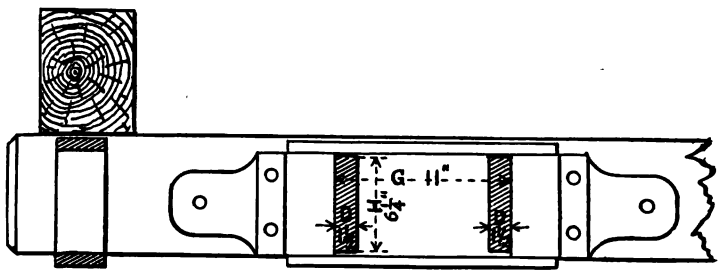


FIG. 68.

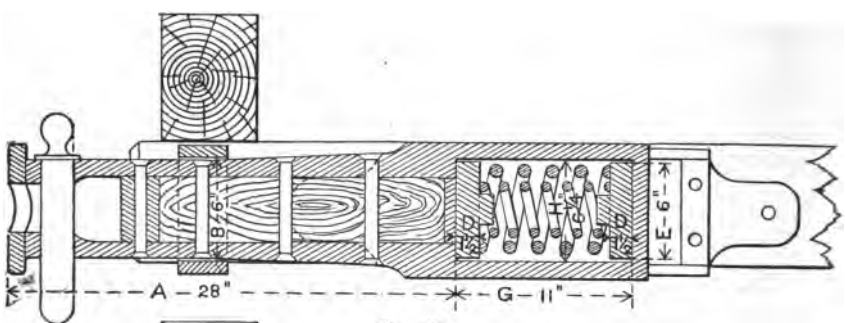
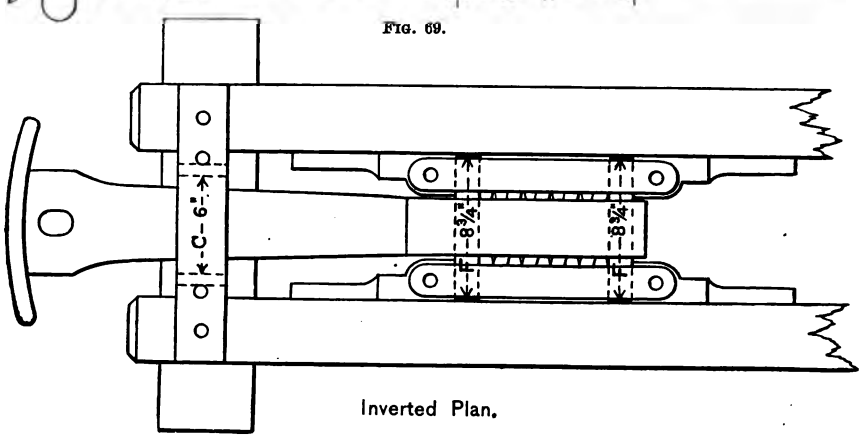


FIG. 69.



Inverted Plan.

FIG. 70.

The width (*C*) of opening for draw-bar, in the carrying-plate or yoke, to be 6 in.

The follower-plates to be made of wrought iron, and rectangular in form, the thickness (*D*) to be 1½ in.; the width (*E*) 6 in. and the length (*F*) 8¾ in.

The length (*G*) of the house of the draw-bar to be 11 in., and the width (*H*) 6¼ in.

The pin-hole in draw-bar to be made to take a pin 2 × 1½ in.

When a strap is used in back end of draw-bar, it shall have a clear space of 11 in. long and 6¼ in. wide. When a spindle is used, it shall be 2 in. diameter, 17 in. long from under side of head to outer edge of key; the key to be 2½ in. wide and ½ in. thick.

The draw-bars to be so placed in the cars as to locate the coupling-pins not less that five inches from the centre to the face of the dead-woods.

Capacity of Draw-springs.

At the same meeting (*see page* 100 *of Report*), it was recommended that the capacity of draw and buffer springs should not be less than 18,000 lbs.

DEAD BLOCKS.

Standard dimensions of dead-blocks were recommended at the Sixteenth Annual Convention, held in Philadelphia in 1882 (*see pages* 45 *and* 47 *of Report of that meeting*). These dimensions were amended at the Eighteenth Annual Meeting, held in Saratoga, as follows:

Double dead-blocks are to be made 8 in. square on the face and 6 in. thick, and are to be placed 22 in. apart from centre to centre, and to have 14 in. space between them.

Single dead-blocks are to be not less than 30 in. long, 7 in. thick and 8 in. deep, measured vertically.

By order of the Executive Committee the amendments were submitted for the approval of the members by letter ballot (*see pages* 156–162 *of this Report*), and as more than two-thirds of the

votes cast were in favor of the amendments they were adopted. Figs. 71 and 72 represent the standard dimensions for dead-blocks as amended by the Association.

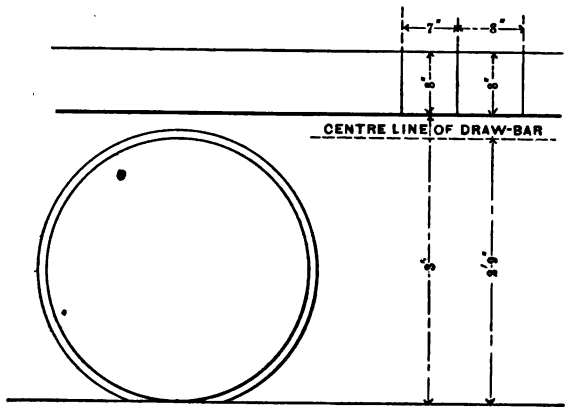


Fig. 71.

DIMENSIONS OF
STANDARD SINGLE AND DOUBLE
DEAD BLOCKS.

Recommended at the Eighteenth Annual Convention of the Master Car Builders' Association, held in Saratoga, in June, 1884.

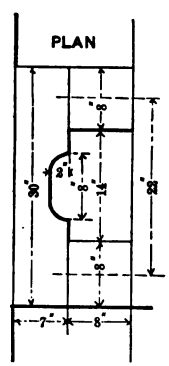


Fig. 72.

PROTECTION OF TRAINMEN FROM ACCIDENTS.

Position of Brake-Shafts.

At the Thirteenth Annual Convention, held in Chicago in 1879, the following resolutions, having reference to the construction of the attachments to cars for the protection of trainmen from accidents, were adopted:

The attachments referred to are shown in Figs. 73 and 74.

"*Resolved*, That this Association recommend that all brake-shafts be placed on the left-hand corner of the car, when a person

is standing on the track facing the end of the car." (*See page 85 of Report of that meeting.*)

Fig. 73 shows the brake-shaft in the position designated.

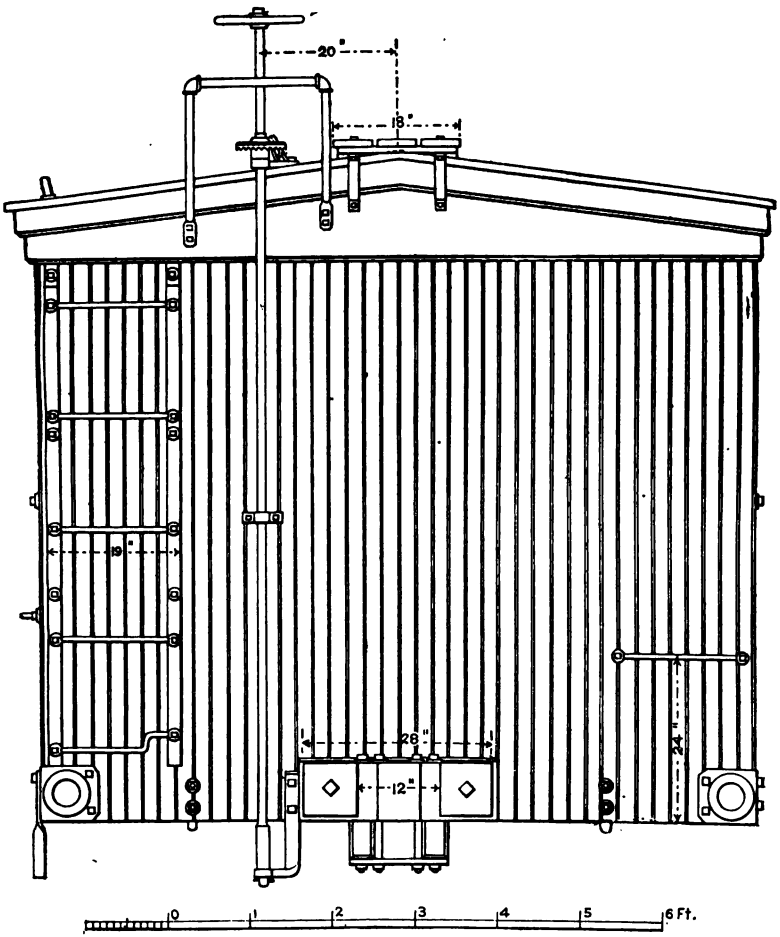


Fig. 73

ATTACHMENTS FOR THE SAFETY OF TRAINMEN.

Brake-Steps or Platform and Fastening of Brake Ratchet-Wheel and Pawl.

[*See pages* 109 *and* 119 *of Thirteenth Annual Report.*]

"That the small platform placed at one end of freight cars, to fasten the brake pawl, etc., be discontinued, the rachet-wheel and pawl to be fastened to a suitable casting on the roof."

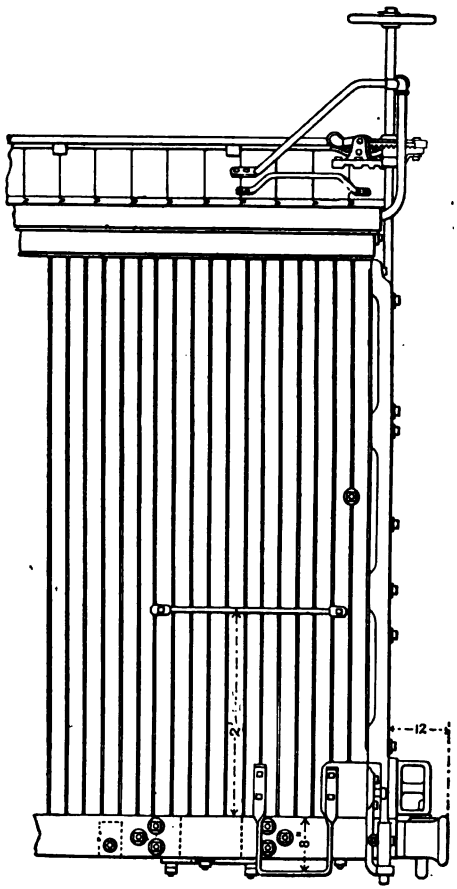


FIG. 74.

ATTACHMENTS FOR THE SAFETY OF TRAINMEN.

RUNNING BOARDS.

[*See pages* 109 *and* 114 *of Thirteenth Annual Report.*]

"That the running-boards be not less than 18 in. wide and 1 in. thick, the ends of which to project $5\frac{1}{2}$ in. outside of the boarding, the projections to be supported by two braces made of 2 in. by $\frac{1}{4}$ in. iron."

STEPS.

[*See pages* 108 *and* 110 *of Thirteenth Annual Report.*]

"That two good substantial steps, made of wrought iron $\frac{1}{2}$ by $1\frac{3}{4}$ in. be fastened, one to each side-sill, at diagonal corners of the car."

Ladder and Handles.

[*See pages* 109, 110 *and* 111 *of Thirteenth Annual Report.*]

"That each box and stock car have two ladders, not less than five steps in each ladder, made of $\frac{5}{8}$-in. round iron, projecting $3\frac{1}{2}$ in. from the siding, securely fastened to each end at diagonal corners, with a handle directly over the ladders, on the roof.

"Mr. C. E. Garey moved that the lower steps of the ladder have a guard or projection in order to prevent men slipping when swinging around the end of the car to get on the step.

"The recommendation as amended was adopted."*

CHECK-CHAINS.

At the Eighth Annual Convention, held in Cincinnati, in 1874, the following resolution was adopted (*see pages* 27 *and* 72 *of Report of that meeting*):

"*Resolved*, That truck and car-body check-chains are, when properly applied, a valuable acquisition on passenger equipment, and your committee recommend their general use."

MARKING CARS.

A resolution was adopted at the Sixteenth Annual Convention (*see page* 158 *of Report*) requesting all railroad companies whose initials are the same as those of other railroad companies, to stencil the name of the road in full on some part of the car where it can readily be seen by freight agents.

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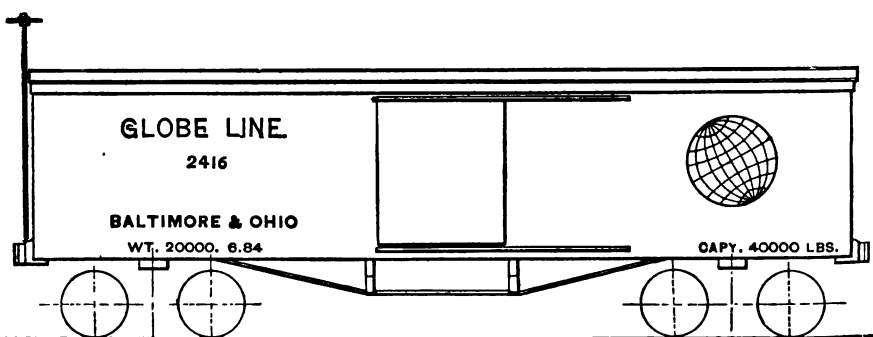
* In a report on the Causes of Accidents to Trainmen made in 1883 (*see page* 28) it was recommended by the Committee that "where ladders are on the end of the car a handle be placed horizontally about 24 in. above the lower edge of sill on side of car above the steps, to enable trainmen to get a firm hold before or while using the steps; also when the ladder is on end of car a handle should be placed on opposite corner from the ladder, and when ladders are on the side of car, two such handles should be placed on each end of the car about 24 in. above the bottom of sill, thus enabling train and yard men to sustain themselves while making couplings, and which would be vastly beneficial should they stumble or otherwise loose their footing."

This report was "received" by the Association, but no other action was taken regarding the attachments which were recommended by the Committee, and are shown in Figs. 73 and 74.

SYSTEM OF LETTERING AND NUMBERING FAST FREIGHT LINE CARS.

At the Eighteenth Annual Convention, held in Saratoga (*see page 96 of this Report*), the following resolutions were adopted, which, with Figs. 75, 76 and 77, describe a proposed system of lettering and numbering "Fast Freight Line" cars:

1st. The half of sides of car on which the doors do not slide, to show the name of the "Fast Freight Line" (spelled out in full) and the car number (in the Fast Freight Line series) immediately below it. In the same panel and within two feet of the sill shall appear (in letters not over four inches high) the name of the railroad company owning or contributing the car, and between the same and the sill shall appear the light weight of the car, with such other information as it is found advisable to give in connection with same.



CARS IN FAST FREIGHT LINE SERVICE.

FIG. 75.

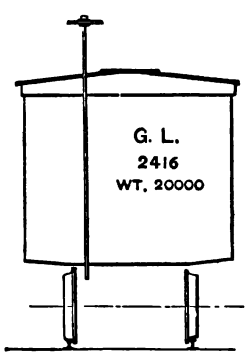


FIG. 76.

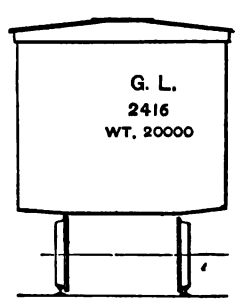


FIG. 77.

2d. The doors should have no marks whatever.

3d. The ends to show the initials of the "Fast Freight Line" with the car number (in the Fast Freight Line series) and the light weight just below them; no other marks will appear on ends of car.

4th. The half of sides of cars on which the doors do slide, to be reserved for advertising symbols or trade-marks where used. The use of profuse lettering in this panel is to be discouraged, however, and it is recommended that only the simplest trade-marks or advertising signs should be used; the capacity of the car to appear near the sill in this same panel.

At the meeting referred to it was decided to refer these resolutions for the decision of the members by letter ballot. In accordance with this action they were so referred (*see pages* 156–162 *of this Report*), and as more than two-thirds of the votes cast were in favor of the resolution, they, and the system they described, are adopted as a standard by the Association.

STORING OF LINE CARS ON FOREIGN ROADS.

At the Seventeenth Annual Convention, held in Chicago in June, 1883, the following resolutions were adopted (*see page* 109 *of the Report of that meeting*):

"*Whereas*, It is a common practice to store line cars on side tracks during summer months or dull times away from home, after they have been in severe service; and

"*Whereas*, Many of the cars after being so stored are found to be more or less out of proper condition, so that they need more or less repairs, and when put into service cause much detention to traffic and many transfers;

"*Be it Resolved, therefore*, That it is the sense of this meeting that all line cars owned by foreign companies should be returned to their owners instead of being stored on foreign tracks, and that a competent man should be detailed to inspect the stored cars and to arrange to have the necessary repairs made during the time such cars are out of service."

DICTIONARY OF TERMS.

At the Fifth Annual Convention, held in Richmond, Va., in 1872 (*see page* 18 *of Report of that meeting*), it was

"*Resolved*, That a committee be appointed with power to publish an illustrated book, defining the proper terms or names of each and every part used in the construction of railway cars, and a description of the use of the same."

At the Fourteenth Annual Convention, held in Detroit in 1880 (*see pages* 11 *to* 20 *of Report of that meeting*),

"The committee to whom was assigned the duty of preparing a Dictionary of Terms used in the Construction of Cars submitted a copy of the book and reported that they had finished their work and were discharged."

ENTERTAINMENTS.

At the Ninth Annual Convention, held in New York in 1875, the following resolution was adopted (*see page* 113 *of Report of that meeting*):

"*Whereas*, The practice of entertaining the members of this Association by its friends has become an established custom, and has thus assumed somewhat the character of an obligation to which those who have so generously dispensed hospitality have, in a measure, felt themselves obliged to conform; and

"*Whereas*, The expenditure of time and money for this purpose has in many cases been very much greater than the members of this Association have the right to expect should be devoted to their enjoyment; and

"*Whereas*, The expense of such hospitality has in some cases been interpreted as having a significance which has been the cause of embarrassment to members;

"*Therefore*, We desire by this resolution, first, to express our thanks for the liberality of our friends in the past; and, secondly, to make the request in this public way, that in the future there shall be no more expenditure of money for the public entertainment of members of this Association."

The preamble and resolution were unanimously adopted.

RULES

GOVERNING THE CONDITION OF, AND REPAIRS TO, FREIGHT CARS FOR THE INTERCHANGE OF TRAFFIC; REVISED AT SARATOGA JUNE 10, 1884.

A code of rules for this purpose has been adopted and amended from year to year, by an organization composed of master car-builders and others, who have held their meetings during the session of the Convention of the Master Car-Builders' Association. The following is a copy of these rules, revised at a meeting held in Saratoga on June 10, 1884.

Resolved, That in voting upon the adoption of rules to govern the condition of, and repairs to, freight cars offered for interchange traffic, including payment for cars in case of their destruction, the vote of each railroad is to be governed by the number of eight-wheel freight cars the road owns, and two four-wheel cars represent one car, and that each 1,000 cars, or the major part thereof, is entitled to one vote, and it shall require two-thirds of all the votes present to approve.

RULE 1.—Each road is to *deliver* the cars to connecting roads in *good running order*, as defined by the following rules:

RULE 2.—Each road may maintain an inspector at junction stations and refuse cars unless they are put in good running order.

RULE 3.—Cars may be refused for any of the following defects:

a. Wheels cracked or broken.

b. Flat spots on wheels exceeding $2\frac{1}{2}$ inches in length.

c. Flanges with flat vertical surfaces extending over $\frac{7}{8}$ inch from tread of wheel.

d. Flanges less than 1 inch thick.

e. Wheels chipped on the tread to a depth of more than $\frac{1}{2}$ inch or leaving the tread less than $3\frac{1}{2}$ inches.

f. Axle journals cut, or less than $2\frac{3}{4}$ inches in diameter, and the size of journals shall be proportioned for capacity as registered on cars:

60,000 lbs.	(4 axles)	to be	not	less	than	$3\frac{3}{4}$	inches in diameter.
50,000 "	"	"	"	"	$3\frac{1}{2}$	"	"
60,000 "	(6 axles)	"	"	"	$3\frac{1}{2}$	"	"
40,000 "	"	"	"	"	$3\frac{1}{4}$	"	"
30,000 "	"	"	"	"	3	"	"
20,000 "	"	"	"	"	$2\frac{3}{4}$	"	"

g. Brakes not in efficient condition.

h. Brake wheels, steps, ladders or running boards not securely fastened or in bad condition.

i. Drawbars or attachments in bad order.

j. Leaky roofs on merchandise or grain cars.

k. Spliced draw sills or draw timbers.

l. Intermediate timbers or outside sills spliced in a manner not provided for in the rules.

m. The general condition of cars considered unsafe to move in heavy trains.

n. Doors in such condition as to render them unsafe as protection from fire and storms.

RULE 4.—In order to give a good dispatch to the movement of cars the inspection by the receiving road and the repairs by the road offering the car shall be promptly made.

RULE 5.—In case a car has defects which do not render it unsafe to proceed on its journey before being repaired, the inspectors may note such defects, and the car be accepted subject to being received back in the same condition.

RULE 6.—In such case a card 4½ × 6½ inches, in the form shown below, may be affixed under the body of the car, for guidance of other inspectors, preferably on the inside of the cross-frame tie-timber, stating the defects with which the car will be received back, and when the car is so repaired the card shall be removed.

Any company finding a car with card on it may make the repairs noted by card, and make bill for the same to the Company putting on the card, the card to accompany the bill as voucher for the work done. All cards shall be printed and filled in on both sides.

(*Name of Road*)

Car No.....Date.....

Initial.....Line.....

Will be received at any point on this company's line, with the following defects :

.....

.....

.....

.....Inspector at.....

RULE 7.—In case the receiving and delivering inspectors disagree as to the condition of the car, the case is to be immediately referred to their superior officers.

RULE 8.—Every effort shall be made to cause the least possible hindrance to the dispatch of traffic in the inspection of cars, and the settlement of any disagreements arising thereunder.

RULE 9.—Each road shall give to foreign cars while on its line the same care as to *repairs*, *oiling* and *packing* that it gives to its own cars, and shall return them in as good general condition as they were when received. Should this not be done the car may be refused upon its return until it is repaired, or until the company which has used it agrees to pay the expense necessary to restore it to such good general condition. Locks are not to be considered a part of the proper equipment of a car, and if left on the cars when offered to foreign roads it will be at the risk of the owner. Roofs lost off cars while in transit, and which upon examination

show faulty construction, namely: The ends of the carlines improperly fastened to the plates, tin roofs improperly cleated down, or rotten carlines or plates; the owner of said car or cars shall be at the expense of replacing the roof. Railroad companies are not responsible for roofs of foreign cars lost off while in their possession showing defects as stated above.

RULE 10.—Wheels and axles used to replace those broken or worn out under fair usage will be charged to the company owning the car.

Wheels with flat spots exceeding $2\frac{1}{2}$ inches in length or diameter, or flanges with flat vertical surface extending more than $\frac{7}{8}$ of an inch from the tread of wheel, or less than one inch thick, shall be considered worn out wheels.

Wheels flatted by sliding or wheels having treads or flanges chipped are not to be considered as worn out under fair usage. Such wheels shall be replaced by the company sliding or chipping them, at their own expense. The condition of each wheel removed must be noted on all bills. All wheels removed for any cause shall be reported to the owner of the car.

RULE 11.—Prices for wheels and axles furnished shall be as follows:

One new 36-inch wheel (less defective) on same axle	$11 00
Two " " " " " " "	21 00
One " 33- " " " " " "	8 00
" " " " (less second-hand) " "	6 00
Two " " " (less defective) " "	16 00
" " " " (less second-hand) " "	12 00
One new axle-turned and fitted (less defective)	8 00
" " " " " (less second-hand)	4 00
Second-hand wheels (less defective), per wheel or per pair.	2 00
Loose wheels refitted on second-hand axle, per wheel or per pair	2 00

When only one wheel is put on an axle it must be of the same circumference as the other wheel on the same axle.

Prick-punching the wheel-seat or shimming the wheel shall under no circumstance be allowed.

RULE 12.—One railroad company rendering a bill against another for wheels or axles *shall note on the bill*, which shall be of the following form:

ADDRESS.....

TO THE PITTSBURG, CINCINNATI & ST. LOUIS RAILWAY CO., DR.

For Wheels and Axles used under.....Cars, Month of.....188 .

DATE.	STATION.	CAR.			WHEELS REMOVED.				SHOP MARKS ON WHEELS AND AXLES.	WHEELS AND AXLES USED.		CHARGE.
		Initial.	Class.	Number.	Maker.	Date Cast.	Number.	Cause of Removal.		No.	New or S. H.	

A full and exact description of the mode and manner of failure, name of manufacturer, the date cast and all shop marks as found on such wheel or axle removed, as well as the owner, number, class and line of cars from under which they were taken, with date and name of station at which they are removed. They shall mark on the inside hub of the wheel substituted the date of its application. Bills may be declined until the above information is fully furnished. If no marks or dates are found on wheels or axles removed, a notation to that effect must be stated on bill.

The following terms shall be used on the bills for wheels and axles in noting the defects of wheels that have failed under fair usage :

Worn Flat—Where the flat spot or spots exceed $2\frac{1}{2}$ inches in length or diameter, care must be taken to distinguish this defect from " slid flat."

Worn Flange—Where the flange is less than one inch thick or has flat vertical surfaces extending more than $\frac{7}{8}$ inch from the tread of the wheels.

Cracked Plate—This term is to be used in reporting all cracks that may occur in the plate other than those extending from the wheel-fit toward the rim, caused by bursting. In the report the length of the crack must be given.

Cracked Brackets—The number of brackets cracked must be stated in the report.

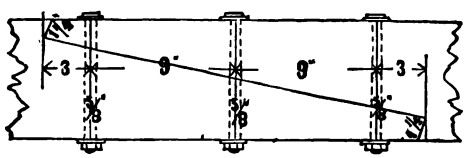
Shelled Out—This term is to be applied to wheels which become rough from circular pieces shelling out of the tread leaving a rounded flat spot, deepest at the edge, with a raised centre. No wheel must be condemned for this fault unless the spots are over $2\frac{1}{2}$ inches in length, or their number is so great as to interfere with the safe running of the wheel.

Rule 13.—If an accepted foreign car is injured upon a road it shall be repaired by and at the expense of the company in possession thereof as promptly as it repairs its own cars.

Such repairs shall be permanently and thoroughly made, and shall conform to the design in detail of the original construction (provided the same can be determined from the car itself), and with the same form and quality of material originally employed.

The companies may, however, agree with each other to substitute for broken parts new standards, such as the axle bearing and box adopted by the Master Car-Builders, improved draw-bars, etc.

RULE 14.—Sills broken or materially injured must be replaced by new ones of the same size and of good quality, an exception to be made of intermediate and outside sills to which the draw timbers are not attached, which, if broken between bolster and end sill only, may be spliced with a "ship splice," as here shown, of 24 inches in length, and secured by three $\frac{5}{8}$-inch bolts, all to be done in a workmanlike manner.



RULE 15.—Any company departing from the above rules without authority shall be liable for the cost of changing the car again to the original standard. The car may be refused until the changes are made or an agreement entered into to send it to the owner for such alterations, in which case proper credit shall be given for the material removed.

RULE 16.—Companies shall promptly furnish to each other, upon requisition, and forward free over their own road, standard materials for the repairs of their cars injured on foreign lines. In such cases the following prices may be charged:

a. Iron castings, 2 cents per pound.

b. Brass journal bearings, 20 cents per pound.

c. Malleable iron, 6 cents per pound.

d. Phosphor bronze bearings, 25 cents per pound.

RULE 17.—When either car-trucks or bodies are destroyed on a foreign road, the owners must be notified immediately, that a settlement may be speedily effected.

The company destroying the same shall have its option whether to rebuild it or pay for the same at the established price.

If it elects to pay for it, a deduction shall be made by the owner for the depreciation of the car-truck or body at the rate of 6 per cent. per annum upon the yearly depreciated value of the parts destroyed since last built: Provided, however, that such

allowance shall in no case exceed 60 per cent. of the established price.

Until further revision of these rules the prices for settlement under this rule shall be as follows:

Eight wheel	box car, 32 to 35 feet long	$500	00
" "	" 32 feet long or under	480	00
" "	cattle car, 32 feet long or over	500	00
" "	ordinary stock car, 32 feet long or under	470	00
" "	gondola car, 20-ton drop bottom	430	00
" "	" coal car, 20-ton hopper bottom	505	00
" "	" 31 feet long or over	380	00
" "	ordinary gondola car, less than 31 feet long	355	00
" "	" flat car, 31 feet long or over	340	00
" "	" " under 31 feet long	330	00
Four "	gondola car with truck and drop bottom	305	00
" "	box car	230	00
" "	ordinary coal car	205	00
One pair 4-wheel trucks		222	00

RULE 18.—If the company destroying the car elects to rebuild it, no allowance shall be made for betterment. In such case the car-truck or body shall be rebuilt by and at the expense of the road destroying it, upon the same plan and of the same kind and quality of materials as originally constructed, within sixty days.

RULE 19.—Running repairs, namely: Such parts as fail under fair usage or require frequent renewals from wearing out or failure resulting from faulty construction on cars belonging to private parties shall be paid for by the parties owning the car. This not to include cars bearing the initials of any railroad company, or that are cared for by a railroad company. And it is recommended that railroad companies in making contracts with private parties insert this rule, or words to the same effect, in their contract.

RULE 20.—When a car is damaged or destroyed on a private track, the railroad company delivering the car upon such track shall be responsible to the car owner for the making good of the damage by the owner of the private track.

RULE 21.—Any railroad company may become a party to these rules by giving notice of its adhesion through its General Mana-

ger or Superintendent to the President of the Master Car-Builders' Association. Each company may withdraw from its participation in these rules by giving thirty days' notice to other roads through a general circular.

RULE 22.—These rules shall take effect on and after August 1, 1884, and be introduced for discussion and revision during one session of the Master Car-Builders' Convention of each year.

RULE 23.—Upon application of the roads representing one-third of the whole number of cars in interest, it shall be the duty of the President to call a meeting for the revision of these rules between August 1, 1884, and August 1, 1885.

LIST OF RAILROADS

WHICH HAVE ADOPTED THE RULES GOVERNING THE CONDITION OF, AND REPAIRS TO, FREIGHT CARS FOR THE INTERCHANGE OF TRAFFIC.

The following is as complete a list as can now be made of the companies which have adopted the above rules. If the names of any railroad companies which have adopted the rules are not included in the following list, their officers are requested to notify the Secretary of the Master Car-Builders' Association, so that the omitted companies may be included in the list hereafter:

Allegheny Valley.
Atchison, Topeka & Santa Fé.
Baltimore & Ohio.
Boston & Albany.
Boston & Maine.
Buffalo, New York & Phila.
Boston, Hoosac Tunnel & Western.
Burlington, Cedar Rapids & Northern.
Canada Southern.
Chesapeake & Ohio.
Chesapeake, Ohio & Southw'n.
Chicago and Atlantic.
Cumberland Valley.
Central Iowa.
Central Vermont.
Connecticut River.
Chicago & Alton.
Chicago, Burlington & Quincy.
Chicago, St. Louis & Pittsburg.
Chicago, Rock Island & Pacific.
Chicago, Milwaukee & St. Paul.
Chicago & Iowa.
Chicago, St. Paul, Minneapolis & Omaha.
Chicago & Grand Trunk.
Cleveland, Columbus, Cincinnati & Indianapolis.
Cleveland, Mt. Vernon & Delaware.
Delaware, Lackawanna & Western.
Delaware & Hudson Canal Co.
Detroit, Grand Haven & Milwaukee.
Detroit, Lansing & Northern.
Des Moines & Fort Dodge.
Eastern.
Fitchburg.

Flint & Pere Marquette.
Gettysburg & Harrisburg & South Mountain.
Grand Trunk & Great Western Division.
Gulf, Colorado & Santa Fé.
Hartford & Connecticut Western.
Housatonic.
Houston & Texas Central.
Hannibal & St. Joseph.
International & Great Northern.
Illinois Central.
Indianapolis & St. Louis.
Indiana, Bloomington & Western.
Kansas City, St. Joseph & Council Bluffs.
Kansas City, Fort Scott & Gulf.
Lake Shore & Michigan Southern.
Lake Erie & Western.
Lehigh Valley.
Maine Central.
Marquette, Houghton & Ontonagon.
Missouri Pacific.
Pittsburg & Lake Erie.
Peoria, Decatur & Evansville.
Pennsylvania Company.
Pennsylvania Railroad.
Michigan Central.
Minneapolis & St. Louis.
New York, Ontario & Western.
New York City & Northern.
New York, New Haven & Hartford.
New York, Chicago & St. Louis.
New York, Lake Erie & Western.
New York, West Shore & Buffalo.
New York Central & Hudson River.
New York & New England.
New York, Pennsylvania & Ohio.
Norfolk & Western.
Northern Pacific.
Ohio & Mississippi.
Ogdensburg & Lake Champlain.
Old Colony.
Pennsylvania & New York Canal and Railroad Co.
Petersburg.
Providence & Worcester.
Pittsburg, Cincinnati & St. Louis.
Philadelphia & Reading.
Rochester & Pittsburg.
Richmond, Fredericksburg & Potomac.
Seaboard & Roanoke.
Southern Central.
Saginaw Valley & St. Louis.
Shenango & Allegheny.
St. Paul & Duluth.
Troy & Boston.
Terre Haute & Indianapolis.
Texas Pacific.
Toledo, Cincinnati & St. Louis.
Toronto, Grey & Bruce.
Union Pacific.
Virginia Midland.
Wabash, St. Louis & Pacific.
Wisconsin Central.
Western Maryland.
West Jersey.
Wilmington & Northern.
Wilmington & Weldon.

CONSTITUTION AND BY-LAWS

OF THE

Master Car-Builders' Association,

As Adopted at the Meeting held at Niagara Falls, October 10 *and* 11, 1882.

ARTICLE I.

NAME.

SECTION 1. The name of the Association shall be "The Master Car-Builders' Association."

ARTICLE II.

OBJECTS AND LIMITS OF ACTION.

SEC. 1. The objects of this Association shall be the advancement of knowledge concerning the construction, repair and service of railroad cars, by discussions in common, investigations and reports of the experience of its members; to provide an organization through which the members, and the companies they represent, may agree upon such joint action as may be required to bring about uniformity and interchangeability in the parts of railroad cars, to improve their construction and to adjust the mutual interest growing out of their interchange and repair; but the action of the Association shall have only a recommendatory character, and shall not be binding upon any of its members or the companies represented in it.

ARTICLE III.

MEMBERSHIP.

SEC. 1. There shall be three classes of members, Active, Representative and Associate members. Each member must sign the constitution or authorize the Secretary to sign for him.

SEC. 2. Any person holding the position of Superintendent of the Car Department, Master Car-Builder, or Foreman of a Railroad Car Shop, or one representative from each Car Manufactur-

ing Company, or other company over one thousand cars, which are not in process of purchase by other parties, may become an Active Member by paying his dues for one year. Unless expelled from the Association his membership shall continue until his written resignation is received by the Secretary.

SEC. 3. Any person having a practical knowledge of car construction may become a Representative Member by receiving a *written* appointment from the President, General Manager or General Superintendent of any railroad company, to represent its interests in the Association, provided that no Representative Member shall represent more than one railroad or system of roads under one General Manager or General Superintendent. Such member shall have all the privileges of an Active Member, including one vote on all questions, and in addition thereto shall on all measures pertaining to the adoption of standards or the expenditure of money have one more vote for each full one thousand cars which are owned, or which are in use and in process of purchase, by the road or system which he represents. His membership shall continue until notice is given the Association of his withdrawal, or of the appointment of his successor. No railroads or system of roads, under one General Manager or General Superintendent, shall have more than one Representative Member. In the enumeration of four, six, eight, or more wheeled cars, four axles to count as one car.

SEC. 4. Civil and mechanical engineers, or other persons having such a knowledge of science or practical experience in matters pertaining to the construction of cars as would be of especial value to the Association or railroad companies, may become Associate Members on being recommended by three members not associates. The names of such candidates shall then be referred to the Executive Committee, which shall report to the Association on their fitness for such membership. They shall be elected by ballot at any regular meeting of the Association, held not less than six months after a candidate has been proposed, and five dissenting votes shall reject. The number of Associate Members shall not exceed twenty. Any Associate Member who shall fail to attend a meeting of the Association for three consecutive years shall cease to be a member. Associate Members shall be entitled to all the privileges of Active Members, excepting that of voting and being elected to office in the Association.

SEC. 5. Any member who, during the meetings of the Association, shall be guilty of dishonorable conduct which is disgraceful to a railroad officer and a member of the Association, or shall refuse to obey the Chairman when called to order, may be expelled by a vote of two-thirds of the members present at any meeting held within one year from the date of the offense.

ARTICLE IV.

OFFICERS.

SEC. 1. The officers of the Association shall be a President, three Vice-Presidents, a Treasurer, Secretary, and six Executive Members. The six Executive Members, with the President, Vice-Presidents and Treasurer, shall constitute the Executive Committee.

ARTICLE V.

DUTIES OF OFFICERS.

SEC. 1. The duties of all officers shall be such as usually pertain to their offices, or may be delegated to them by the Executive Committee or the Association.

ARTICLE VI.

EXECUTIVE COMMITTEE.

SEC. 1. The Executive Committee shall exercise a general supervision over the interests and affairs of the Association, recommend the amount of the annual assessment, to call, to prepare for and to conduct general conventions, and to make all necessary purchases, expenditures and contracts required to conduct the current business of the Association, but shall have no power to make the Association liable for any debt to an amount beyond that which at the time of contracting the same shall be in the Treasurer's hands in cash, and not subject to prior liabilities. All expenditures for special purposes shall only be made by appropriations acted upon by the Association at a regular meeting.

SEC. 2. The Executive Committee shall make a report of the proceedings of each of its meetings, such reports to be made accessible to all the members of the Association. It shall have the proceedings of the regular meetings of the Association published, subject to instructions from the latter. It shall have

power to withhold from the published proceedings papers and reports containing old matter readily found elsewhere, those specially meant to advocate personal interests, those carelessly prepared or controverting well-established facts, and those purely speculative or foreign to the purposes of the Association, or any which in the opinion of the Committee are unworthy of publication; it being understood, though, that this discretion shall always be exercised subject to the action of the Association.

SEC. 3. Two-thirds of the members of the Executive Committee may call special meetings of the Association, to be held not less than thirty days after a notice thereof has been mailed to each member of the Association.

SEC. 4. Five members of the Executive Committee shall constitute a quorum for the transaction of business.

ARTICLE VII.

ELECTION AND APPOINTMENT OF OFFICERS AND TENURE OF OFFICE.

SEC. 1. The officers, excepting as otherwise herein provided, shall be elected at the regular meeting of the Association, held in June of each year, and the election shall not be postponed excepting by unanimous consent.

PRESIDENT AND TREASURER.

SEC. 2. The President and Treasurer shall be elected by written ballots by a majority of the votes cast, and shall hold office for one year, or until successors are chosen.

VICE-PRESIDENTS AND EXECUTIVE MEMBERS.

SEC. 3. The Vice-Presidents shall hold office for one year, and the Executive Members for two years, or until successors are chosen. Three Vice-Presidents and three Executive Members to be elected each year; provided, however, that three of the latter shall be appointed by the President holding office at the time of the adoption of this amendment. The Executive Members thus appointed to hold office until successors are chosen at the annual meeting following.

SEC. 4. In the election of Vice-Presidents each Active and Representative Member may cast as many votes as there are Vice-Presidents to be elected. The number of votes may be given to

one candidate or distributed among more, as the person entitled to cast them may choose. Executive Members shall be voted for in the same way. The three candidates for each of the offices named who receive the largest number of votes shall be declared elected.

SECRETARY.

SEC. 5. A Secretary, who may or may not be a member of the Association, shall be appointed by a majority of the Executive Committee at its first meeting after the annual election, or as soon thereafter as the votes of a majority of the members of the Executive Committee can be secured for a candidate. The term of office of the Secretary thus appointed, unless terminated sooner, shall cease at the first meeting after the next annual election succeeding his appointment of the Executive Committee organized for the transaction of business. Two-thirds of the members of the Executive Committee shall, however, have power to remove the Secretary at any time. His compensation, if any, shall be fixed for the time that he holds office by a vote of a majority of the Executive Committee. He shall also act as Secretary of the Executive Committee.

TREASURER.

SEC. 6. The Treasurer shall be required to give bonds to an amount which a majority of the members of the Executive Committee demand. No bill shall be paid by him for the Association, excepting for current expenses, until it has been certified by the person or persons authorized to contract it, and audited by the Executive Committee.

ARTICLE VIII.

COMMITTEES.

SEC. 1. At the first session of the annual meeting the President shall appoint a Nominating Committee of five members, who are not officers of the Association, and this committee shall send the names of nominees for officers of the Association to fill vacancies for the ensuing year to the Secretary before the election of officers is in order, and they shall be announced by him as soon as received. The election shall not be held until the day after such announcement, excepting by unanimous consent. Any three other members may nominate candidates for any office.

AUDITING COMMITTEE.

SEC. 2. At the first session of each annual meeting an Auditing Committee, consisting of three members not officers of the Association, to be nominated by any member who does not hold office, shall be elected in the same way as vice-presidents and executive members are voted for. This Auditing Committee shall examine the accounts and vouchers of the Treasurer and certify whether they have been found correct or not. After the performance of this duty they shall be discharged by the acceptance of their report by the Association.

COMMITTEE ON SUBJECTS FOR INVESTIGATION AND DISCUSSION.

SEC. 3. At each annual meeting the President shall appoint a committee whose duty it shall be to report at the next annual meeting subjects for investigation and discussion, and if the subjects are approved by the Association, the President, as hereinafter provided, shall appoint committees to report on them. It shall also be the duty of the Committee to receive from members questions for discussion during the time set apart for that purpose. This Committee shall determine whether such questions are suitable ones for discussion, and if so, they shall so report them to the Association.

COMMITTEES OF INVESTIGATION.

SEC. 4. When the Committee on Subjects has reported and the Association approved of subjects for investigation the President shall appoint special committees to investigate and report on them, and he may be authorized to appoint a special committee to investigate and report on any subject which a majority of the members present may approve of.

ARTICLE IX.

THE RECOMMENDATION OF STANDARDS.

SEC. 1. Any proposition recommending the adoption of standard constructions or practice shall be in writing and be accompanied by drawings, if the latter are necessary for a clear understanding of the subject. Such proposition shall then be submitted to the Association for discussion, after which a vote shall be taken to decide whether the proposition shall be submitted for decision by letter ballot to all the members entitled to

vote. If decided in the affirmative the Secretary, within three months from the time the vote of the Association is taken on such measure, shall send by mail to each member a blank ballot, and a copy of the proposed recommendation, with a report—to be approved by the Executive Committee—of the discussion thereon. Such ballot to be filled up, signed and remailed to the Secretary, who shall count all the ballots received within sixty days from the date that they were sent to members, and he shall then announce the vote in such manner as the Executive Committee may prescribe. Any recommendation securing two-thirds of the votes cast shall be adopted by the Association.

SEC. 2. All reports, resolutions and recommendations involving the use, or proposed use, by railroad companies of any device or process which forms the subject-matter of any existing patent, shall first be submitted to the Executive Committee, and shall be submitted to the Association only by the Executive Committee.

ARTICLE X.

ANNUAL CONTRIBUTIONS.

SEC. 1. Every member will be subject to the payment of annual dues, to be assessed at each annual meeting, to defray the necessary expenses of the Association, provided that no assessment shall exceed five dollars. Each Representative Member shall pay in addition to his own dues so assessed the same amount for each additional vote to which he is entitled.

Such dues shall be payable when the amount thereof is announced by the President at each annual meeting, and no member who is one year in arrears shall be entitled to a voice in the Association. The name of any member who is three years in arrears for dues, may be struck from the list of members at the discretion of the Executive Committee.

ARTICLE XI.

AMENDMENTS.

SEC. 1. This Constitution may be amended at any regular meeting by a two-third vote of the members present, *provided* that written notice of the proposed amendment has been given at a previous meeting at least six months before.

BY-LAWS.

TIME OF MEETING.

I. The regular meeting of the Association shall be held annually on the second Tuesday in June.

HOURS OF SESSION.

II. The regular hours of session shall be from ten o'clock A. M. to two o'clock P. M.

PLACE OF MEETINGS.

III. The place for holding the regular meetings of the Association shall be determined by a majority of the members present.

QUORUM.

IV. At any regular meeting of the Association fifteen or more members entitled to a vote shall constitute a quorum.

ORDER OF BUSINESS.

V. The business of the meetings of this Association shall, unless otherwise ordered by vote, proceed in the following order:

1st. Calling the roll.
2d. Reading the minutes of the last meeting.
3d. Address by the President.
4th. Admission of new members.
5th. Reports of Secretary and Treasurer.
6th. Assessment and announcement of annual dues.
7th. Appointment of Nominating and other committees.
8th. Election of Auditing Committee.
9th. Unfinished business.
10th. New business.
11th. Reports of committees.
12th. Reading and discussing questions propounded by members.
13th. Routine and miscellaneous business.
14th. Election of officers.
15th. Adjournment.

QUESTIONS FOR DISCUSSION, SPECIAL ORDER OF.

VI. Unless otherwise ordered the discussion of questions proposed by members shall be the special order at 12 o'clock M. of each day of the annual meeting.

DECISIONS.

VII. The votes of a majority of the members present shall be required to decide any question, motion or resolution which shall come before the Association, unless otherwise provided.

DISCUSSIONS.

VIII. No questions or discussions as to the regulation of wages, or the amount to be paid by the day, week or month, or the number of hours that shall constitute a day's work of employés, shall be allowed at the meetings of this Association.

IX. No patentees or their agents shall be admitted in the meetings of the Association for the purpose of advocating the claims of any patent or patentee, unless by unanimous consent.

X. No member shall speak more than twice in the discussion of any question until all the other members who want to speak and have not been heard have spoken.

JOHN McFARLAND.

John McFarland, after a short illness, died in Richmond, Va., on the 16th of July, 1883, aged 57 years.

He was born in Glasgow, Scotland, in 1826, and came to this country with his parents in 1836, settling in Richmond, Va., making that city his home until his death.

After learning the machinist trade, he became desirous of following the occupation of a locomotive engineer. Having succeeded in attaining that position, he served as such on several Southern roads. He took such an interest in his occupation that he soon attracted attention by his deportment and mechanical skill; and in 1855, at the age of 29, was appointed Master Mechanic of the Richmond & Danville Railroad, holding that position for nearly eighteen years. He was then made Master of Transportation of the Richmond & York River Railroad for a short time, and in 1875 went to the Chesapeake & Ohio as Master of Machinery, the title afterwards being changed to Superintendent of Motive Power. This position he held until his death.

Mr. McFarland had been in failing health for a couple of years prior to his death, but having a strong constitution many years of usefulness seemed to be before him. His last meeting with the Master Mechanics and Master Car-Builders' Association was at Chicago in 1883, and on his return it was the general verdict of his friends and associates that his health was much benefited by the trip. The writer remembers hearing him say on his return that he felt better than he had for years. He little thought then that the end was so near.

His sister and her husband having both died, leaving a family of five children, three girls and two boys, with no one to care for them, threw the responsibility upon him; this duty he faithfully performed.

Never having married, his sole aim seemed to be to educate and provide a comfortable home for the charge left to his care, ever watchful over their interests, kind and indulgent as a father could be and of a genial disposition, his death was to them a severe blow.

Mr. McFarland was held in high esteem by the officers of the Chesapeake & Ohio Railroad, and his amiable and generous disposition endeared him to all his associates and claimed the respect and obedience of his subordinates. He was buried in Hollywood Cemetery, Richmond, Va.

T. L. CHAPMAN.

LIST OF SUBJECTS,

WITH THE COMMITTEES APPOINTED TO REPORT THEREON AT THE ANNUAL CONVENTION TO BE HELD AT THE HYGEIA HOTEL, OLD POINT COMFORT, VA., BEGINNING TUESDAY, JUNE 9, 1885.

1. *A Standard Form for the Treads and Flanges of Wheels.*—The report of this Committee to include a recommendation of a maximum and minimum limit gauge for the flanges of wheels and cars received for interchange. H. Stanley Goodwin, Lehigh Valley Railroad, Bethlehem, Pa.; M. N. Forney, 73 Broadway, New York; R. C. Blackall, Delaware and Hudson Canal Company, Albany, New York; John W. Cloud, Pennsylvania Railroad, Altoona, Pa.; Herbert Wallis, Grand Trunk Railway, Montreal, Canada.

2. *Standard Freight-Car Trucks.*—Resolutions were adopted at the last Convention (*see page* 116) instructing the Committee to "present to the Convention in another year what they would recommend as a standard truck for cars of 40,000 pounds capacity and (*see page* 110) that a standard freight-car truck should be of the diamond form * * * and should have cross channels so that it may be used with a swinging bolster or rigid bolster, * * * and that it is the sense of the meeting (*see page* 113) that a five-feet wheel-base would be accepted * * * and (*see page* 118) that the Master Car-Builders' journal is large enough for cars whose capacity does not exceed 40,000 pounds." The Committee were also instructed (*see page* 120) to use the Master Car-Builders' standard journal bearing and journal box in the trucks for cars not exceeding 40,000 pounds capacity. Robert Miller, Michigan Central Railroad, Detroit, Mich.; Wm. McWood, Grand Trunk Railway, Montreal, Canada; William Forsyth, Chicago, Burlington and Quincy Railroad, Aurora, Ill.; Joseph Wood, Pennsylvania Company, Ft. Wayne, Ind.; J. N. Barr, Chicago, Milwaukee and St. Paul Railroad, Milwaukee, Wis; Henry S. Bryan, Chicago and Iowa Railroad, Aurora, Ill.

3. *Brake-Shoes, Brake-Beams and Interchangeable Parts of the Brake Arrangements of Cars.*—This Committee was continued, with instructions to submit a definite form of brake-shoe, brake-beam, and of the interchangeable parts for adoption at the next Annual Convention. L. Packard, New York Central and Hudson

River Railroad, West Albany, N. Y.; John S. Lentz, Lehigh Valley Railroad, Packerton, Pa., and J. W. Marden, Fitchburg Railroad, Boston, Mass.

4. *Standard House-Car to carry* 60,000 *Pounds of Lading.*—The Committee on this subject was continued and was united with the Committee on Freight-Car Framing and Trussing, with instructions to report on a definite form of framing and trussing, for adoption at the next Annual Convention. H. Stanley Goodwin, Lehigh Valley Railroad, Bethlehem, Pa.; John W. Cloud, Pennsylvania Railroad, Altoona, Pa.; Leander Garey, New York Central and Hudson River Railroad, Grand Central Depot, New York; F. M. Wilder, New York, Lake Erie and Western Railroad, Susquehanna, Pa.; L. Packard, New York Central and Hudson River Railroad, West Albany, N. Y.; Wm. McWood, Grand Trunk Railway, Montreal, Canada; R. McKenna, Delaware, Lackawanna and Western Railroad, Scranton, Pa.; R. H. Soule, New York, West Shore and Buffalo Railroad, Frankfort, N. Y.

5. *Standards and Appliances for the Safety of Trainmen.*—This Committee was appointed in accordance with the following resolution:

Resolved, That a Committee be appointed to prepare a circular calling the attention of railroad managers to the standards and the appliances for the safety of trainmen, which have been recommended by this Association, and that this Committee be urged to do everything in their power to secure their adoption.

John Kirby, Lake Shore and Michigan Southern Railroad, Cleveland, O.; B. K. Verbryck, Chicago, Rock Island and Pacific Railroad, Chicago, Ill.

6. *Passenger-Car Framing and Trussing.*—Thomas A. Bissell, Barney and Smith Manufacturing Company, Dayton, O.; William Forsyth, Chicago, Burlington and Quincy Railroad; and Robert Miller, Michigan Central Railroad.

7. *Automatic Freight-Car Brakes.*—Godfrey W. Rhodes, Chicago, Burlington and Quincy Railroad, Aurora, Ill.; George Hackney, Atchison, Topeka and Santa Fé Railroad, Topeka, Kansas; B. Welch, Central Pacific Railroad, Sacramento, Cal.

8. *Freight-Car Roofs.*—F. M. Wilder, New York, Lake Erie and Western Railroad, Susquehanna, Pa.; R. C. Blackall, Delaware and Hudson Canal Co., Albany, N. Y.; and D. Hoit, Gilbert Car Manufacturing Co., Troy, N. Y.

9. *Trap-doors in the Roofs of Passenger Cars.*—This Committee was continued and was requested to furnish plans at the next annual convention. F. D. Adams, Boston and Albany Railroad, Allston, Mass.; John Mackenzie, New York, Chicago and St. Louis Railroad, Cleveland, O.; Sanford Keeler, Flint and Pere Marquette, East Saginaw, Mich.

10. *Side-Dumping and Drop-Bottom Coal-Cars.*—Joseph Townsend, Chicago and Alton Railroad, Bloomington, Ill.; John Hodge, Missouri Pacific Railroad, St. Louis, Mo.; and C. E. Gore, Lafayette Car Works, Lafayette, Ind.

11. *Standard Dead-Blocks.*—This Committee to submit detailed drawings of dead-blocks to be adopted as standards by the Association. Charles Blackwell, Norfolk and Western Railroad, Roanoke, Va.; George W. Demarest, Northern Central Railroad, Baltimore, Md.; M. N. Forney, 73 Broadway, New York.

12. *The Comparative Advantages of the two Methods of Constructing Freight Cars, with and without Platform Timbers or End Sills projecting from the End of the Car.*—E. B. Wall, Pittsburg, Cincinnati and St. Louis Railroad, Columbus, Ohio; B. K. Verbryck, Chicago, Rock Island and Pacific Railroad, Chicago, Ill.; Geo. W. Cushing, Northern Pacific Railroad, St. Paul, Minn.

13. *Subjects to be Reported at the next Annual Convention for Investigation and Discussion at the Succeeding Convention.*—R. H. Soule, New York, West Shore and Buffalo Railroad, Frankfort, N. Y.; Sanford Keeler, Flint and Pere Marquette Railroad, East Saginaw, Mich.; James N. Lauder, Old Colony Railroad, Boston, Mass.

14. *Committee of Arrangements for the next Annual Convention.*—M. M. Pendleton, Seaboard and Roanoke Railroad, Portsmouth, Va.; J. W. Fleming, Petersburg Railroad, Petersburg, Va.; John S. Whitworth, Norfolk Southern Railroad, Norfolk, Va.

LIST OF OFFICERS AND MEMBERS

OF THE

MASTER CAR-BUILDERS' ASSOCIATION.

OFFICERS FOR 1884-'85.

PRESIDENT.

LEANDER GAREY, N. Y. Central & Hudson River Railroad, Grand Central Depot, N. Y. City.

VICE-PRESIDENTS.

WILLIAM McWOOD, Grand Trunk Railway, Montreal, Canada.
JOHN W. CLOUD, Pennsylvania Railroad, Altoona, Pa.
B. K. VERBRYCK, Chicago, Rock Island & Pacific Railroad, Chicago, Ill.

TREASURER.

JOHN KIRBY, Lake Shore & Michigan Southern Railroad, Cleveland, Ohio.

EXECUTIVE MEMBERS.

(*Constituting, with the foregoing officers, the Executive Committee.*)

* T. A. BISSELL, Barney & Smith Mfg. Co., Dayton, Ohio.
* L. PACKARD, N. Y. Central & Hudson River Railroad, West Albany, N. Y.
* JOHN S. LENTZ, Lehigh Valley Railroad, Packerton, Pa.
† F. D. ADAMS, Boston & Albany Railroad, Alston, Mass.
† JOSEPH TOWNSEND, Chicago & Alton Railroad, Bloomington, Ill.
† E. B. WALL, Pittsburgh, Cincinnati & St. Louis Railroad, Columbus, Ohio.

SECRETARY.

M. N. FORNEY, 73 Broadway, Room 124, New York City.

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* Term of office expires June, 1885.
† Term of office expires June, 1886.

LIST OF ACTIVE MEMBERS.

Date of becoming an active member.	Name.	Railroad Company.	Address.
1888	Adams, J. L.,	Chicago & Atlantic Railroad,	Huntingdon, Ind.
1873	Aylesbury, Thomas,	Kan. City, St. Joseph & Council Bluffs Railr'd,	St. Joseph, Mo.
1867	Baker, David H.,	Pennsylvania Railroad,	Jersey City, N. J.
1883	Barber, J. C.,	Missouri Pacific Railroad,	Sedalia, Mo.
1875	Billings, H. S.,	Pullman Palace Car Company,	Jersey City, N. J.
1884	Billings, Samuel D.,	Norwich & Worcester Railroad,	Norwich, Conn.
1881	Bissell, Thomas A.,	Barney & Smith Mfg. Co.,	Dayton, O.
1880	Blackwell, K. A.,	Manufacturer, Canal and Condé streets,	Montreal, Canada.
1873	Bray, F. O.,	Lake Shore and Michigan Southern Railroad,	Adrian, Mich.
1883	Briggs, R. H.,	Chesapeake, Ohio & Southwestern Railroad,	Elizabethtown, Ky.
1884	Brownell, F. G.,	Burlington & Lamoille Railroad,	Burlington, Vt.
1882	Bryan, H. S.,	Chicago & Iowa Railroad,	Aurora, Ill.
1883	Carlton, Howard,	Buckeye Car Mfg. Co.,	Columbus, O.
1882	Carter, E. D.,	Terre Haute & Indianapolis Railroad,	Terre Haute, Ind.
1883	Cassady, Thomas,	Cin., Ind., St. Louis & Chicago Railway,	Cleves, O.
1884	Chamberlain, Eugene,	New York Central & Hudson River Railroad,	East Buffalo, N. Y.
1883	Chamberlain, J. T.,	Boston & Albany Railroad,	Allston, Mass.
1871	Chamberlain, W. E.,	Providence & Worcester Railroad,	Providence, R. I.
1868	Coon, Robert V.,	Troy & Boston Railroad,	Troy, N. Y.
1879	Cooper, H. L.,	Lake Erie & Western Railroad,	Lima, O.
1873	Davenport, W. R.,	Erie Car Works,	Erie, Pa.
1871	Davis, Willis,	Green Line,	Elizabeth, N. J.
1868	Demarest, George W.,	Northern Central Railroad,	Baltimore, Md.
1873	Denver, James,	New York, New Haven & Hartford Railroad,	New Haven, Conn.
1884	Divine, John F.,	Wilmington & Weldon Railroad,	Wilmington, N. C.
1878	Donaby, R.,	New York Central & Hudson River Railroad,	Niagara Falls, N. Y.
1882	Doran, J. E.,	Boston & Albany Railroad,	East Albany, N. Y.
1883	Dunbar, O. P.,	Wheeling & Lake Erie Railroad,	Norwalk, O.
1883	Duncan, T. G.,	Cincinnati, Washington & Baltimore Railr'd,	Zaleski, O.
1884	Ennis, W. C.,	New York, Susquehanna & Western Railroad,	Wortendyke, N. J.
1883	Ensign, Sidney P.,	Ensign Mfg. Co.,	Lime Rock, Conn.
1884	Finley, L.,	Hot Springs Railroad,	Malvern, Ark.
1877	Fletcher, John B.,	National Car Co.,	St. Albans, Vt.
1867	Ford, M. P.,	Pittsburgh, Cincinnati & St. Louis Railroad,	Columbus, O.
1871	Garey, C. E.,	Harlem Div., N. Y. Cen. & Hudson R. R. R.,	Station T, N. Y. City.
1883	Gause, J. Taylor,	Harlan & Hollingsworth Co.,	Wilmington, Del.
1883	George, N. M.,	Danbury & Norwalk Railroad,	Danbury, Conn.
1884	Giffcken, E. G.,	Savannah, Florida & Western Railroad,	Savannah, Ga.
1870	Gore, C. E.,	Lafayette Car Works,	Lafayette, Ind.
1873	Graham, Charles,	Delaware, Lackawanna & Western Railroad,	Kingston, Pa.
1883	Gramling, George H.,	South Carolina Railroad,	Charleston, S. C.
1883	Greenland, Thomas,	Lake Erie & Western Railroad,	Lima, O.
1872	Griffith, S.,	The Continuous Draw Bar Co.,	163 State st., Chicago, Ill.
1869	Hackatborn, J. L.,	Kentucky Central Railroad,	Covington, Ky.
1870	Hackett, George,	Central Division, Philadelphia & Reading R'd,	Elizabeth, N. J.
1882	Hackney, George,	Atchison, Topeka & Santa Fé Railroad,	Topeka, Kansas.
1883	Hall, John H.,	Boston & Lowell Railroad,	Nashua, N. H.
1883	Hecker, Frank J.,	Peninsular Car Works,	Detroit, Mich.
1884	Hegewisch, A.,	United States Rolling Stock Co.,	35 Broadway, New York.
1877	Hemphill, R. M.,	Wabash, St. Louis & Pacific Railroad,	Peoria, Ill.
1884	Henney, J. B.,	Hartford Steam Co.,	Hartford, Conn.
1873	Hildrup, W. T.,	Harrisburg Car Co.,	Harrisburg, Pa.
1884	Hill, C. H.,	Sodus Bay & Southern Railroad,	Sodus Point, Wayne Co., [N. Y.
1877	Hill, John,	St. Paul & Duluth Railroad,	St. Paul, Minn.
1875	Hill, J. B.,	N. Y. Elevated Railroad, 98th st. and 3d ave.,	New York City.
1879	Hodge, John,	Missouri Pacific Railroad,	St. Louis, Mo.

Date of becoming an active member.	Name.	Railroad Company.	Address.
1882.	Hofecker, W. L.,	Pittsburgh & Western Railroad,	Zeleinople, Pa.
1869.	Hoit, D.,	Gilbert Car Mfg. Co.,	Troy, N. Y.
1882.	Hollister, James D.,	Savannah, Florida & Western Railroad,	Savannah, Ga.
1875.	Hopkins, D. A.,	Manufacturer,	113 Liberty street, N. Y.
1883.	Howard, Frank,	Northern Pacific Railroad,	Brainerd, Minn.
1883.	Hunt, Thomas B.,	P. & E. Division, Pennsylvania Railroad,	Renovo, Pa.
1884.	Hunter, David W.,	Providence & Worcester Railroad,	Valley Falls, R. I.
1883.	Irwin, Samuel,	Missouri Pacific Railroad,	Atchison, Kansas.
1883.	Jackson, Job H.,	Jackson & Sharp Co.,	Wilmington, Del.
1882.	Johnson, F.,	Buffalo Car Co.,	Buffalo, N. Y.
1883.	Keith, Isaac N.,	Keith Mfg. Co.,	West Sandwich, Mass.
1882.	Kirby, T. B.,	Lake Shore & Michigan Southern Railroad,	Chicago, Ill.
1874.	Lee, Israel,	Pittsburgh, Ft. Wayne & Chicago Railroad,	Ft. Wayne, Ind.
1872.	Leighton, James T.,	Jackson & Sharp Co.,	115 Broadway, New York.
1867.	Levan, John P.,	Pennsylvania Railroad,	Altoona, Pa.
1871.	Lightner, J.,	Boston & Providence Railroad,	Boston, Mass.
1882.	Manier, B. F.,	Jones Car Mfg. Co.,	Schenectady, N. Y.
1882.	Marden, A. H.,	Fitchburg Railroad,	Charlestown, Mass.
1882.	McCarty, H. C.,	Phila. & Erie Division of Penna. Railroad,	Williamsport, Pa.
1883.	McCuen, J. G.,	Mexican Central Railway,	El Paso, Texas.
1882.	McDevitt, B.,	Chicago West Division Railroad,	Chicago, Ill.
1880.	McGregor, James,	Michigan Car Co.,	Detroit, Mich.
1882.	McIntyre, John H.,	Rutland Division, Central Vermont Railroad,	Rutland, Vt.
1880.	McPherson, Reuben,	Flint & Pere Marquette Railroad,	East Saginaw, Mich.
1875.	McWood, William,	Grand Trunk Railway,	Montreal, Canada.
1882.	Merrill, W. F.,	Chicago & Alton Railroad,	Chicago, Ill.
1883.	Messimer, D. M.,	P. & E. Division, Pennsylvania Railroad,	Renovo, Pa.
1867.	Mileham, J. N.,	N. Y., Lake Erie & West'n R'd, 234 Third st.,	Jersey City, N. J.
1881.	Minshull, E.,	New York, Ontario & Western Railroad,	Middletown, N. Y.
1871.	Moore, John C.,	Belvidere Division, Pennsylvania Railroad,	Lambertville, N. J.
1871.	Morgan, William A.,	Norfolk & Western Railroad,	Lynchburg, Va.
1883.	Munsell, T. H.,	Wagner Sleeping Car Co.,	Buffalo, N. Y.
1882.	Murray, S. W.,	Milton Car Works,	Milton, Pa.
1870.	Olmstead, E. A.,		
1877.	Ortton, John,	New York Central & Hudson River Railroad,	West Albany, N. Y.
1881.	Packard, L.,	New York Central & Hudson River Railroad,	West Albany, N. Y.
1883.	Parks, R. H.,	St. Charles Car Co.,	St. Charles, Mo.
1873.	Patten, James T.,	Wason Mfg. Co.,	18 Broadway, N. Y. City.
1879.	Peabody, D. B.,	Illinois Midland Railroad,	Paris, Ill.
1882.	Pendleton, M. M.,	Seaboard & Roanoke Railroad,	Portsmouth, Va.
1872.	Phelps, B. N.,	Fourth Avenue City Railr'd, 1721 Madison ave.,	Tremont P. O., N.Y.City.
1880.	Potts, Robert,	Michigan Central Railroad,	St. Thomas, Canada.
1883.	Ramseyer, Wm. H.,	Sioux City & Pacific Railroad,	Missouri Valley, Iowa.
1884.	Rhodes, Godfrey W.,	Chicago, Burlington & Quincy Railroad,	Aurora, Ill.
1883.	Richardson, John,	Cincinnati Southern Railroad,	Ludlow, Ky.
1882.	Riley, Patrick,	New York, Ontario & Western Railroad,	Oswego, .N Y.
1873.	Robson, A. C.,	Lake Shore & Michigan Southern Railroad,	Buffalo, N. Y.
1883.	Salveter, T. C.,	St. Charles Car Co.,	St. Charles, Mo.
1868.	Scoville, C. F.,	Wells & French Co.,	Chicago, Ill.
1883.	Seevers, T. L.,	Central Iowa Railway,	Marshalltown, Iowa.
1884.	Shoemaker, S. B.,	Swissvale Car Co. (Limited), 105 Wood street,	Pittsburgh, Pa.
1884.	Skinner, J. R.,	Delaware & Hudson Canal Co.,	Oneonta, N. Y.
1870.	Smith, C. A.,	Union Tank Line, 267 Fourth street,	Jersey City, N. J.
1880.	Smith, Peter,	New York Central & Hudson River Railroad,	Foot W. 30th st., N. Y.
1881.	Smith, William O.,	Lake Shore & Michigan Southern Railroad,	Norwalk, O.
1881.	Snyder, H. F.,	Pardee Car & Machine Works,	Watsontown, Pa.
1883.	Steinbrunner, A. G.,	Cleveland, Columbus, Cincinnati & Ind. R'd,	Cleveland, O.
1871.	Stevens, G. E.,		Prairie du Chien, Wis.

Date of becoming an active member.	Name.	Railroad Company.	Address.
1868..	Stevens, Samuel,	Old Colony Railroad,	Taunton, Mass.
1873..	Stewart, T. B.,	Hartford & Wethersfield Street Railroad,	Hartford, Conn.
1879..	Sweeney, John,	New Haven & Northampton Railroad,	New Haven, Conn.
1880..	Taylor, Joseph,	Michigan Car Co.,	Detroit, Mich.
1884..	Traver, James J.,	Adirondack Railroad,	Saratoga Springs, N. Y.
1882..	Van Buskirk, W. G.,	Newburgh, Dutchess & Connecticut Railroad,	Dutchess Junction, N. Y.
1880..	Van Vechten, J.,	New York, Lake Erie & Western Railroad,	Port Jervis, N. Y.
1883..	Voorhees, John,	Indianapolis Car and Mfg. Co.,	Indianapolis, Ind.
1871..	Webster, H. A.,	New York Elevated Railroad,	71 Broadway, N. Y. City.
1870..	Welch, B.,	Central Pacific Railroad,	Sacramento, Cal.
1880..	West, Joel,	Chicago, Burlington & Quincy Railroad,	Burlington, Iowa.
1883..	Whitworth, John S.,	Norfolk Southern Railroad.	Norfolk, Va.
1882..	Wickes, J. H.,	Merchants' Despatch Transportation Co.,	Rochester, N. Y.
1871..	Wiers, J. H. F.,	Paige Car Wheel Co.,	Cleveland, O.
1872..	Wilder, Milton,	New York, Lake Erie & Western Railroad,	Buffalo, N. Y.

LIST OF REPRESENTATIVE MEMBERS.

Date of becoming a representative member.	Name.	Railroad Company.	No. of cars owned.	Address.
1882..	Adams, F. D.,	Boston & Albany Railroad,	6,000	Alston, Mass.
1884..	Armbruster, Joseph,	East Tenn., Va. & Ga. Railroad,	4,170	Knoxville, Tenn.
1883..	Avery, E. A.,	Des Moines & Fort Dodge Railway,	251	Grand Junction, Iowa.
1883..	Blackall, R. C.,	Delaware & Hudson Canal Co.,	10,000	Albany, N. Y.
1882..	Blackwell, Charles,	Norfolk & Western Railroad,	3,196	Roanoke, Va.
1883..	Bushnell, R. W.,	Burlington, Cedar Rapids & Northern,	3,235	Cedar Rapids, Iowa.
1884..	Canham, H.,	Central Vermont Railroad,	2,570	St. Albans, Vt.
1884..	Chapman, T. L.,	Chesapeake & Ohio Railway,	6,283	Richmond, Va.
1882..	Cloud, John W.,	Pennsylvania; Northern Central; West Jersey; Philadelphia, Wilmington & Baltimore; Alexandria & Fredericksburg, and Baltimore & Potomac Railroads,	47,321	Altoona, Pa.
1883..	Coulter, J. P.,	Ohio & Mississippi Railroad,	2,348	Aurora, Ind.
1883..	Cushing, Geo. W.,	Northern Pacific Railroad,	9,117	St. Paul, Minn.
1882..	Ellis, John S.,	Boston, Hoosac Tunnel & Western,	1,015	Mechanicville, N. Y.
1882..	Fleming, J. W.,	Petersburg Railroad,	144	Petersburg, Va.
1882..	Forsyth, William,	Chicago, Burlington & Quincy R'd,	15,560	Aurora, Ill.
1882..	Fuller, William,	New York, Pennsylvania & Ohio,	7,834	Cleveland, O.
1882..	Garey, Leander,	New York Central & Hudson River,	32,313	Grand Cent. Depot, N.Y.
1882..	Goodwin, H. Stanley,	Lehigh Valley Railroad,	18,823	Bethlehem, Pa.
1882..	Haines, S. W.,	Pittsburgh & Lake Erie Railroad,	1,791	Pittsburgh, Pa.
1884..	Haselton, Geo. H.,	Rome, Watertown & Ogdensburg R'd,	1,765	Oswego, N. Y.
1884..	Helfrick, H. J.,	Louisville, New Albany & Chic. R'd,	2,286	New Albany, Ind.
1884..	Henney, John R.,	N. Y., New Haven & Hartford R. R.,	3,425	New Haven, Conn.
1884..	Hitchcock, Robert,	Connecticut River Railroad,	474	Springfield, Mass.
1884..	Hills, John,	St. Paul & Duluth Railroad,	920	St. Paul, Minn.
1882..	Hovey, Jacob P.,	Rochester & Pittsburgh Railroad,	3,249	Rochester, N. Y.
1880..	Huidekoper, H. S.,	Western Car Company,	1,384	Philadelphia, Pa.
1883..	Keeler, Sandford,	Flint & Pere Marquette Railroad,	2,600	East Saginaw, Mich.
1882..	Kenison, Charles H.,	Maine Central Railroad,	2,232	Augusta, Me.
1883..	Kirby, John,	Lake Shore & Michigan Southern,	16,000	Cleveland, O.
1882..	Kohler, U. H.,	Wabash, St. Louis & Pacific Railr'd,	19,633	Toledo, O.

Date of becoming a representative member.	Name.	Railroad Company.	No. of cars owned.	Address.
1884	Lauder, James N.,	Old Colony Railroad,	2,577	Boston, Mass.
1882	Lentz, John S.,	Pennsylvania & New York Canal & Railroad Co.,	4,139	Packerton, Pa.
1882	Lyons, Henry D.,	Marquette, Houghton & Ontonagon,	1,352	Marquette, Mich.
1883	Mackenzie, John,	New York, Chicago & St. Louis,	7,244	Cleveland, O.
1882	Marden, J. W.,	Fitchburg Railroad,	3,371	Boston, Mass.
1882	McCrum, J. S.,	Kansas City, Fort Scott & Gulf,	2,615	Kansas City, Mo.
1882	McGee, James,	Houston & Texas Central Railroad,	2,116	Houston, Texas.
1884	McIlwain, J. D.,	Grand Trunk (Great Western Div.),	5,782	Hamilton, Ontario.
1883	McKenna, R.,	Delaware, Lackawanna & Western,	23,987	Scranton, Pa.
1882	Miller, Robert,	Michigan Central Railroad,	10,000	Detroit, Mich.
1883	Parker, Frederick,	Detroit, Grand Haven & Milwaukee,	700	Detroit, Mich.
1884	Pickering, Sidney,	Louisville, Evansville & St. Louis R'd,	1,050	Evansville, Ind.
1884	Pratt, Elias E.,	New York & New England Railroad,	3,952	Boston, Mass.
1882	Richardson, D. C.,	Boston & Maine Railroad,	1,854	Lawrence, Mass.
1882	Richardson, Ed.,	Shenango & Allegheny Railroad,	300	Greenville, Pa.
1883	Riley, Patrick,	Peoria, Decatur & Evansville Railr'd,	1,705	Mattoon, Ill.,
1882	Rommel, George,	Wilmington & Northern Railroad,	155	Coatesville, Pa.
1882	Sargent, George M.,	Chicago, St. Louis & Western R. R.,	1,799	First National B'k B'ld'g, Chicago, Ill.
1883	Short, William A.,	Wisconsin Central Railroad,	1,812	Stevens' Point, Wis.
1882	Snow, W. B.,	Illinois Central Railroad,	8,565	Chicago, Ill.
1883	Soule, R. H.,	New York, West Shore & Buffalo,	5,451	Frankfort, N. Y.
1883	Sutherland, Thomas,	Chicago & Grand Trunk Railway,	2,240	Port Huron, Mich.
1884	Taylor, G. M.,	Cleveland, Mt. Vernon & Del. R. R.,	784	Mt. Vernon, O.
1883	Titus, H. D.,	Southern Central Railroad,	309	Auburn, N. Y.
1882	Townsend, Joseph,	Chicago & Alton Railroad,	8,000	Bloomington, Ill.
1882	Trainham, Wm. H.,	Richmond, Fred'ksb'g & Potomac,	140	Richmond, Va.
1883	Turreff, W. F.,	Cleveland, Columbus, Cin. & Ind.,	8,645	Cleveland, O.
1883	Vail, Allen,	Buffalo, New York & Philadelphia,	6,330	Buffalo, N. Y.
1882	Verbryck, B. K.,	Chicago, Rock Island & Pacific R. R.,	7,982	Chicago, Ill.
1882	Wall, E. B.,	Pittsburgh, Cincinnati & St. Louis,	10,993	Columbus, O.
1884	Wallis, Herbert,	Grand Trunk Railway,	16,157	Montreal, Canada.
1884	Warren, B.,	Indiana, Bloomington & Western R'd,	4,607	Indianapolis, Ind.
1882	Watrous, George C.,	Detroit, Lansing & Northern Railr'd,	1,050	Ionia, Mich.
1882	Wicke, Casper,	Cumberland Valley Railroad,	477	Chambersburg, Pa.
1882	Wilder, F. M.,	New York, Lake Erie & Western,	31,274	Susquehanna, Pa.
1882	Williams, Charles C.,	West Jersey Railroad,	248	Camden, N. J.
1884	Wood, Joseph,	Pennsylvania Company,	23,604	Ft. Wayne, Ind.
	Total number of cars represented.....		439,305	

ASSOCIATE MEMBERS.

Date of becoming an associate member.	Name.	Address.
1873	Forney, M. N.,	73 Broadway, New York.
1879	Raymond, J. H.,	Honore Building, Chicago, Ill.

INDEX.

A

Accidents to train men, 23, 174.
Account of Secretary, 9.
Active members, list of, 206.
Adams, F. D., remarks of, 13, 29, 30, 31, 33, 83, 84, 89, 94, 95, 130, 134, 137, 140, 141, 142, 144, 145, 146, 147, 149, 150.
Address of President, 4.
Adjournment, 113, 114, 153.
Advantage of coning wheels, 64.
Afternoon session, 114, 130.
Altoona, 80.
Amendment to Constitution, 14.
Amendment to motion on standard wheel-tread and flange, 83; to continue committee on trucks, 116; to resolution relating to couplers, 148, 149; that automatic couplers shall couple in a vertical plane, 145.
Ames brake, 124, 136.
Ames coupler, 136, 140, 142, 146, 147, 149, 150.
Anderson, Mr., remarks of, 73.
Angle of face of wheel-flange, 51.
Annual dues, 13.
Annual meetings, purpose of, 4.
Arch-bar, 111.
Appropriations, 163, 165.
Archer coupler, 136, 146, 147, 149, 150.
Arrangements, committee on, 204.
Arrears for dues, 9.
Assessment of dues, 164.
Association, objects of, 15.
Attachments of draw-bars, 21, 171.
Attachments for safety of trainmen, engraving of, 24.
Auditing committee, election of, 13; report of, 100.
Automatic couplers, 135; report on, 141, 164; trial of, 113.
Automatic brakes, committee on, 203; discussion of, 121; report on, 121, 164; Westinghouse, motion in relation to, 124.
Average load of cars, 111.
Axes and saws in cars, 33.
Axle gauges, 16, Plate VIII; standard, 167.
Axle, for 42-in. wheels, 117; for 40,000 lb. car, 117; size of, for standard truck, 116; spring of, 119; standard, 17, 117, 119, 167, Plate IX; letter ballot on, 156; motion to adopt for cars of 40,000 lbs. capacity, 116, 118.

B

Backs of flanges of wheels, distance between, 16, 71, 166.
Baker, David H., remission of dues, 35, 165.
Baltimore, 129.
Baltimore & Ohio Railroad, 54, 124.
Barbed nails, 129.
Bearing surface, 45.
Bearings, heating of, 118.
Bevel of tread of wheels, 68, 69.
Bissell, Mr., remarks of, 29, 85, 95, 107, 116, 117, 122, 129, 130, 146, 152, 153.
Blackall, Mr., remarks of, 33, 34, 73, 96, 94, 109, 136, 145, 148, 149.
Blackwell, Mr., remarks of, 120.
Blackstone coupling, 125.
Board of Trade, British, 40.
Body-bolster, 105, 106.
Bolster, swinging and rigid, 110, 112.
Bolt-heads, system of, 17.
Bond, Geo. M., remarks of, 38.
Boring wheels, 17, 167.
Boston, Hoosac Tunnel & Western Railroad, 28.
Box-cars, lettering and numbering of, 96, 157, 158, 160; frames of, Plate VII.
Brake, Ames, 124.
Brake-bars, iron or steel, 87; truss rods for, 87; wooden, 87.
Brake-heads and shoes, combined, 88; independent, 88.
Brake ratchet-wheel, standard for, 175.
Brake, Rote, 128; Westinghouse automatic, motion relating to, 124.
Brake-shafts, position of, 23, 174; resolution relating to position of, 24.
Brake-shoe, Christy, 88; Collins, 88; Congdon, 87; Fowler, 88; reversible hook, 88; standard, 88.
Brake-shoes, brake-beams, etc., commitee on, 202; report on, 87.
Brake-shoes, motion to continue committee on, 89.
Brakes, automatic freight car, committee on, 203; report on, 121, 164; compression, motion relating to, 124; buffer, 123, 124; hanging of, 88, 117; standard, 5.
Brake-steps, 25; standard, 175.
British Board of Trade, 40.
Buffalo Iron Works, 80.
Buffer-brakes, 123, 124.
Buffer-springs, capacity of, 15, 173.

C

Caffrey, Mr., remarks of, 74.
Camber of cars, 104.
Capacity mark, 97.
Capacity, of cars, 97; of draw-springs, 173; of freight cars, 109.
Car Accountants' Association, 96, 97.
Car coupler, functions of, 136; committee, 114.
Cars, average load of, 111; camber of, 104; lettering and number of, 5; marking of, 27, 177, 178; number represented, 8, 209; of 40,000 lbs. capacity, 116, 117; of 60,000 lbs. capacity, 116, 117; resolution in relation to storing of, 179.
Car-wheels, gauge of, 40.
Cast-iron brake-shoes, 87.
Cast-iron wheels, 75.
Central Pacific Railroad, 122.
Chairman of Committee on draw-bars, 114.
Chairman, remarks of, 30, 31, 115, 116, 117, 118, 119, 120, 121, 124, 125, 129, 131, 141, 142, 146, 149, 150, 153. See also President and Leander Garey.
Channel-bars, 112, 117, 116.
Chapman, T. L., appointment of to prepare memoir of W. J. McFarland, 120.
Check-chains, 26, 177.
Chicago, Burlington & Quincy Railroad, 122, 148; truck, 110.
Chill, of flange, 47; of throat of flange, 80; of throat of wheel, 53.
Chilling, theory of, 47.
Chill-molds, 47, 53; diameter of, 15, 166.
Christy brake-head, 88, 89.
Circular, announcing next convention, 163; in relation to number of cars owned, 163; in relation to gauge of track, 39; to general managers and superintendents, 163.
Cloud, Mr., remarks of, 29, 33, 79, 80, 94, 98, 101, 105, 106, 110, 112, 113, 114, 129, 138, 139, 150, 144, 145, 146, 149, 150.
Coal-cars, committee on, 204.
Codification of standards, 15.
Collection of dues, checks on, 100.
Collins' brake-shoe, 88.
Commission of experts on car couplers, 133, 136, 145, 146.
Commissions, railroad, 114, 115, 134, 135, 136.
Committee, on adoption of standards, 31; on arrangements for next meeting, 204; on automatic brakes, 203; motion to discharge, 122; on brake-shoes, brake-beams, etc., report of, 87, 202; on car couplers, 114; on car shops and car shop machinery, motion to continue, 95; on comparative advantages of the two methods of constructing freight cars, with and without platform timbers or end sill projecting from the end of the car, 204; on freight car framing and trussing, report of, 101, 102; on freight car roofs, 204; on house car to carry 60,000 pounds, 203; on passenger car framing and trussing, 203; motion to continue, 125; on piece work in building freight cars, report of, 90; on place of holding next meeting, 38; on side dumping and drop-bottom coal cars, 204; continuance of, 131; on standard form for the treads and flanges of wheels, 202; on standard freight car trucks, 202; on standard house car to carry 60,000 pounds of lading, 203; on standards and appliances for the safety of train men, 203; on standard dead-blocks, 204; on subjects for investigation and discussion, 116, 204; report of, 153; on system of lettering and numbering line cars, report of, 95, discharge of, 99; on sharp flanges, 85, report of, 86; on standards and appliances for the safety of train men, continuation of, 90; on standard house car, report of, 100, 101; on trap door in roof of cars, appointment of, 33; report of, 115; on trucks, motion to continue, 116; on wheel tread and flange, 83, 85, 86; to nominate officers, 8.
Committees, list of, 202.
Compromise wheel, 14.
Coned tread, 54.
Coned wheels, 54, 81; advantages of, 65; bearing of tread of, 64.
Cone of wheel, 61.
Coneing of wheels, 58; advantage of, 64.
Conicity of wheels, 61; reversed, 55.
Congdon brake-shoe, 87, 88.
Constitution, amendment to, 14; and by-laws, 191–199.
Conway Ball coupler, 150.
Couplers, automatic, report on, 164; trial of, 113; commission of experts on, 133; committees on, 7; for freight cars, 5; functions of, 136; principles of, 137; report on automatic freight car couplers, 131; resolution relating to, 147.
Curves, 41; gauge of, 73, 74.
Cylindrical tread, 54, 81.
Cylindrical wheels, advantage of, 65.

D

Davenport, Mr., remarks of, 34, 75, 78, 80, 81, 85, 98, 104, 111, 112, 116, 118, 119, 120, 121.
Davenport's standard flange, 77.
Dead-blocks, 149; committee on, 204; distance between, 15, 31, 173; letter ballot on, 156; resolutions relating to, 14; standard dimensions of, 22, 173; standard drawings of, 5.
Dead-woods, 15.
Delaware & Hudson Canal Co., 113.
Demerest, Mr., remarks of, 130.
Denver & Rio Grande Railroad, 122.
Derailments, 40.
Diagonal truss, 106.
Diagram of action of truck model, 62.
Diameter of chill moulds, 15, 166.
Diamond-truck, 116, 117; resolution relating to, 110–112.
Dictionary of terms, 27, 180; letter relating to, 126.
Dimensions of draw-bars, standard, 171.
Distance, between dead-blocks, 15, 173; between the backs of flanges of wheels, 16, 69, 71, 72, 73, 166; over guard rails, 71.

Dogs, for boring wheels, 17.
Doors, marking of them, 98.
Douglas, Benjamin, Jr., letter from, 31.
Draw and buffer springs, capacity of, 15.
Draw-bars, 113, 133; attachments of, 21, 171; dimensions of, 22, 171; height of, 14, 20, 29, 171; standard attachments of, 171; standard dimensions of, 171; standard height of, 171; varying heights of, 138.
Draw-gear, 20; standard, 170.
Draw-springs, capacity of, 15, 22, 171.
Dues, annual, 13; arrears of, 9; assessment of, 164; posting of, 35, 165; remission of, 35, 165.

E

Election of auditing committee, 13; of officers, 152.
Elevation of rails, 41.
End-play of wheels, 49.
Engineer, 69; of maintenance of way, 83.
Entertainments, 28; resolution in relation to, 180.
Executive Committee, 41, 134, 153, 205; minutes of meeting of, 163–165; report on standards, 14, 163; resolution in relation to, 4.
Experts on car couplers, 133, 136.

F

Fastening of brake ratchet wheel and pawl, 25.
Fast freight line cars, 95; system of lettering and numbering, 178; letter ballot on 156, 158–160.
Fast freight lines, initials of, 99.
Fig. 1, diagram showing diameter of chill-moulds, 16; Fig. 2, diagram showing distance between backs of flanges, 16; Figs. 3–8, sections of screw threads, 18; Figs. 9, 10, limit gauges for round iron, 20; Fig. 11, attachments of draw-bars, 21; Figs. 12, 13, diagram showing dimensions of dead-blocks; Figs. 14, 15, attachments for the safety of train men, 24, 25; Figs. 16–18, sections of wheel treads and flanges, 42; Fig. 19, section of flange and rail-head, 43; Figs. 20, 21, sections of flanges and rail-heads, 44; Fig. 22, section of flange and rail-head, 45; Fig. 23, section of flange and rail-head, 46; Fig. 24, section of flange and rail-head, 47; Fig. 25, section of flange and rail-head, 48; Figs. 26, 27, sections of flanges and rail-heads, 50; Figs. 28, 29, sections of flanges and rail-heads, 52; Fig. 30, section of flange and rail-head, 55; Fig. 31, section of flange and rail-head, 56; Figs. 32, 33, sections of worn rail-heads, 57; Fig. 34, section of flange and reversed rail-head, 57; Figs. 35–37, model to show action of curved wheels, 59; Fig. 38, diagram showing action of model, 62; Fig. 39, section of tread of wheel and rail-head, 63; Figs. 40, 41, sections of worn treads of wheels and rail-heads, opposite p. 64; Fig. 42, section of flange and rail-head, 64; Fig. 43, section of flange and rail-head, 65; Figs. 44, 45, sections of flanges and rail-heads, 66; Fig. 46, section of flange and rail-head, 67; Figs. 47–50, sections of worn treads of wheels and rail-heads, opposite p. 68; Figs. 51–54, sections of worn treads of wheels and rail-heads, next to page 69; Fig. 55, proposed standard wheel-tread and flange, 70; Fig. 56, Davenport's proposed standard wheel-tread and flange, 77; Fig. 57, diagram showing difference between proposed standard wheel-tread and flange and existing wheel, 82; Fig. 58, diagram showing diameter of chill-molds, 166; Fig. 59, diagram showing distance between backs of flanges of wheels, 166; Figs. 60–65, sections of screw-threads, 169; Figs. 66, 67, limit gauges for round iron, 170; Figs. 68–70, attachments and dimensions of draw-bars, 172; Figs. 71, 72, diagram showing dimensions of dead-blocks, 174; Figs. 73, 74, attachments for the safety of train-men, 175, 176; Figs. 75–77, diagrams showing system of lettering and numbering line cars, 178.
Flange and tread, committee on, 83, 85, 202; of German State Railroads, 43; proposed standard, 70, 72.
Flanges of wheels, Plate VI; angle of, 51, 53; distance between, 16, 69, 71, 72, 73, 166; form of, 34, 39, 76; engravings of, 42, 43, 44, 45, 46, 47, 48, 50, 52, 55, 56, 57, 57, 63, opposite 64, 64, 65, 66, 67, 70, 77, 82; length of, 76, 80, 85; sharp, 35; standard form of, 51; room, 52.
Flange-way, 40. 41, 71.
Flint & Pere Marquette Railroad, 106.
Forney, M. N., account of, 9–13; appointment of, 134, 151, 165; paper by, 39–73; remarks of, 88, 74, 79, 81, 83, 84, 85, 108. 112, 113, 117, 118, 119, 120, 122, 124, 130, 135, 150, 152, 153. See Secretary.
Frames of box-cars, Plate VII.

G

Garey, C. E., remarks of, 4, 26, 83, 115, 117, 122, 123, 130, 151.
Garey, Leander, remarks of, 3, 114 (see President, remarks of).
Gauge, compromise, 14; form, 14; line, 54; of car wheels, 40, 49, 166; of rail, point to measure from, 73; of rails and wheels, 164; of switches, 41; of track, 40. Plates IV, V; circular relating to, 39; on curve, 73; widening of, 41.
Gauges, for wheels and axles, 16 and Plate VIII; of screw threads, 19; standard limit gauges for round iron, 19, 170.
German State Railroads, standard tread and flange of, 43, 53.
Gifford coupler, 143, 149, 150.
Goodwin, Mr., remarks of, 14, 35, 74, 76, 78, 81.
Gore, Mr., remarks of, 106, 108.
Guard and wing-rails, standard gauge for, 73.
Guard-rail, 41, 54, 71; distance over, 72; location of, 40.
Gun metal brake shoes, 87.

H

Hackney, Mr., remarks of, 108, 111, 122.
Hackett, Mr., appointment as Teller, 13.
Handles, 26; and ladders standard, 177.
Height of draw-bars, 20, 28, 29; standard, 171.
Height of flanges of wheels, 76, 80.
Hitchcock, Mr., remarks of, 142, 144.
Hook coupling, 144.
House-car, standard, committee on, 203.
Hovey, Mr., remarks of, 117, 118, 119.
Howe truss, 103, 105
Hygeia hotel, 153.

I

Independent brake-heads and shoes, 83.
Interchange of traffic, 5; rules for, 181-190.
Initials, of fast freight lines, 99, 178; of railroads, 27.
Inverted arch-bar, 111.
Invitations, 28; reading of, 113.
Iron body-bolster, 105.

J

Janney coupler, 136, 140, 145, 148, 149, 150.
Journal-bearing, standard, 17, 168, Plate X.
Journal-box, standard, 17, 168, Plate XI.
Journal, diameter of, 117.
Journals, protection of, from rust, 34.
Journal, size of, for 60,000 lb. car, 118.

K

Keeler, Mr., remarks of, 34, 98, 105, 106, 109, 113, 125, 129, 130, 133, 135, 137, 138, 140.
Kirby, Mr., remarks of, 29, 34, 81, 90, 98, 110, 113, 117, 129, 146, 153.

L

Ladders and handles, 26; standard, 177.
Lauder, Mr., remarks of, 145.
Legislatures, 5.
Lehigh Valley Railroad rails, 44, 45, 51, 74.
Lentz, Mr., remarks of, 13, 28, 29, 30, 34, 85, 90, 97, 98, 115, 129
Letter ballots, 34, 156, 158-160; diameter of axle submitted to, 119; on dead-blocks, 156; on lettering and numbering cars, 156, 157; on standard axle, 156; on standard limit gauges for round iron and standard wheel-gauge, 161; publication of, 100.
Lettering and numbering of cars, 5, 95, 96; letter ballot on, 156, 157, 158-160; standard system for, 178.
Light weight of car, 97.
Lightner, J., remission of dues of, 35, 165.
Limit gauges for round iron, 19; standard, 170.
Limit gauges, resolution relating to, 19.
Line cars, 130; lettering and numbering of, report on, 95; standard system of, 178; storing of, 27; resolution relating to, 179.
Link and pin, 137, 140, 141; coupling, 147.
List of officers and members, 205; of subjects, 202.
Load of cars, average, 111.
Location of frogs, 40; of guard rails, 40.
Long Branch, 129.
Loose link, 146.

M

Main rails, 41.
Marden, Mr., remarks of, 29, 30, 84, 89, 114, 131, 133, 141, 148, 149.
Marking cars, resolution relating to, 130; system of, 177, 178.
Massachusetts Railroad Commission, 134, 142.
Master Car-Builders' Standard Axle, 117, Plate IX; form of, 119; motion to adopt for cars of 40,000 lbs. capacity, 118; size at middle, 118; spring of, 119.
McFarland, W. J., death of, 7; memoir of, 200.
Master Mechanics' Convention, 130.
Members, list of, 202.
McIlwain, Mr., remarks of, 31, 89, 97, 98, 116, 122, 129, 141.
McKenzie, Mr., remarks of, 31, 32, 33, 111, 114, 115, 118, 141, 142, 148, 149.
Members, delinquent in dues, 35; list of, 206; number of, 8.
Memoir of W. J. McFarland, 200.
McWood, Mr., remarks of, 79.
Michigan Central Railroad track, 110.
Mileham, Mr., remarks of, 79.
Miller, Mr. remarks of, 29, 37, 73, 79, 108, 111, 113, 114, 119, 120, 122, 123, 129, 142, 146, 147.
Miller coupling, 125.
Miller, draw-bar, failure of, 148.
Miller hook, 136, 147.
Miller platform, 140, 148.
Minutes, correction of 4; reading of, 4; of meetings of Executive Committee, 163, 165.
Mitchell coupler, 136, 150.
Model of truck, 58, 59, 60; experiments with, 60.
Motion, instructing committee on standard truck to use the standard journal bearing and box, 120; referring form of tread and flange to committee, 85; referring to channel bars, 121; referring to hanging of brakes, 121; referring to Westinghouse automatic brake, 124; relating to adoption of standards, 31; relating to compression brakes, 124; relating to height of draw-bars, 28; relating to rigid and swinging bolsters, 112; relating to report of committee on freight car framing and trussing, 108; relating to report on lettering and numbering line cars, 98, 99; relating to size of width of standard axle, 118; relating to standard axle, 119; reconsideration of, 118; relating to standard form of wheel tread and flange, 75; relating to standard freight car truck, 110; that automatic couplers should couple on a vertical plane, 137; to adopt the standard axle for cars of 40,000 lbs. capacity, 118; to appoint committee to see car coupler trials, 114; to appoint expert to examine

couplers, 150; substitute for, 151; to continue committee on accidents to train men, 90; to continue committee on brake-shoes, etc., 89; to continue committee on car-shops and car-shop machinery, 95; to continue committee on side-dumping and drop-bottom coal cars, 131; to continue committee on trap-doors, 115; to continue committee on trucks, 116; to discharge committee on automatic brakes, 122; to establish size of journal-bearing for standard truck, 116; to excuse Mr. Garry, 114; to excuse Mr. Wilder, 114; to make standard axle 4¼ in. diameter in middle, 119; to receive report on freight car roofs and continue committee, 129; to receive report in sharp flanges, 87; to refer form of axle to Secretary, 120; to refer letter of Railroad Gazette to Executive Committee, 126; to remit dues 35. See resolutions.

N

New York Central Railroad rail head, 43.
New York, New Haven and Hartford Railroad rail head, 51.
Niagara Falls, 129.
Nickel Plate Line, 148.
Nominating Committee, report of, 75.
Normal form of tread of wheels, 67.
Numbering and lettering line cars, report on, 95; standard system of, 178.
Nuts, system of, 17.

O

Objects of the association, 115.
Old Point Comfort, 153.
Officers, list of, 205; report of committee to nominate, 152; election of,
Oscillation, due to coned wheels, 65.
Otis, Mr., remarks of, 73.
Outer rail, elevation of, 41.

P

Packard, Mr., remarks of, 89, 116, 117, 124, 130.
Pan Handle Railroad, 148.
Paper on the relation of railroad wheels and rails to each other, 39—73.
Passenger car framing and trussing, committee on, 203: report on, 125.
Patentee and supply agents, resolution in relation to, 15.
Patents, 112; on channel-bars, 112; on couplers, 136, 139.
Pawl for brake ratchet wheel, fastening of, 25, 175.
Pedestal, standard, 17, 168, plate XII.
Pennsylvania Railroad, 122, 148; distance between flanges of wheels, 72; flange of wheels, height of, 80; tread and flange, 43.
Permanent way departments, representatives of, 41, 164.
Philadelphia & Reading Railroad, rail head and wheel tread, 55; worn rail, 56.
Piece-work, 91, 94: report on, 90.
Pin and link, to be dispensed with in automatic coupler, 137.
Platform, 25.
Place of holding next annual meeting, see last page of cover; committee on, 38; report on, 129; vote on, 130.
Plate I., plan A of truck; plate II., plan B of truck; plate III., plan C of truck; plate IV., rail-section switch and frog; plate V., table of dimensions of track on various roads; plate VI., sections of flanges and treads of wheels; plate VII., frames of box cars; plate VIII., wheel and axle gauges; plate IX., standard axle; plate X., standard journal-bearing; plate XI., standard journal-box; plate XII., standard pedestal.
Platform timbers, committee on, 204.
Position of brake-shafts, 23, 174.
Posting names of members in arrears of dues, 35, 165.
Potter draw-bar, 122.
Pratt truss, 108.
Pratt & Whitney Co., 19, 38.
Precious metal, 58, 74.
President, 3; address of, 4; remarks of, 33, 34, 35, 38, 73, 74, 79, 80, 81, 84, 86, 87, 90, 94, 95, 98, 101, 105, 108, 112, 113, 114. See chairman and Leander Garey.
Proposed form for standard tread and flange, 70.
Protection of train men from accidents, 23, 174.
Publication of list of members and amounts paid by them in annual report, 100.

Q

Question relating to preservation of journals from rust, 24.

R

Radial axle, 58.
Radius, of throat of flange, 74, 76, 78, 79; of tops of rail, 80.
Rail-heads, engravings of, 43, 44, 45, 46, 47, 48, 50, 52, 55, 56 57, 63, 64, 65, 66, 67; radius of top of, 80.
Rail-road commission, 5, 115, 134, 135, 136, 142; of New York, communication from, 32, 165.
Rail-road department, British Board of Trade, 40.
Rail-road Gazette, letter from, 126; record of, of accidents, 40.
Rail-road wheels and rails in relation to each other, paper on, 39-73.
Rail, rolled by Scranton Steel Co., 48
Rail sections, standard, 41.
Rails, shape of sides of heads of, 50; standard for gauging, 51; standard for form of, 51, 73; elevation of, 41.
Ratchet wheels, 25; standard attachments for, 175.
Reading Railroad, standard flange, 79; standard rail-section and tread and flange, 44, 81.

Recommendation of standards, adoption of, 31.
Reed brake, 122.
Relation of railroad wheels and rails to each other, paper on, 39.
Report, of auditing committee, 100; of committee on, automatic freight car brakes, 121, 164; automatic freight car couplers, 131, 164; brake-shoes, brake-beams, etc., 87; freight-car framing and trussing, 100-102, 108; freight-car roofs, 126, 129; lettering and numbering line cars, 93, 98, 99; passenger car framing and trussing, 125; piece work in building freight-cars, 90; plans for car-shops, and car-shop machinery, 94; on resolutions, 151; sharp flanges, 35, 86, 87; side dumping and drop-bottom coal-cars, 131; standard house car, 100, 101, 164; standards and appliances for safety of trainmen, 90; standard trucks, 35, 36, 86; subjects, 153; trap-doors in roofs of passenger cars, 115; to nominate officers, 75, 152; to select a place for holding next meeting, 129; of executive committee on revision of standards, 14; of Secretary, 8; of Treasurer, 13.
Reports, of committee not to be made public until read, 165; price of, 164.
Representative members, list of, 208.
Representation of permanent way departments, 164.
Resolution, recommending that Mr. Forney be retained to make tests of car couplers, 151: referring methods of marking cars to letter ballot, 130; relating to, brake-steps, etc., 25, 175; check-chains, 27, 177; couplers, 147; dead-blocks, 14; diamond truck, 110, 112; dictionary of terms, 27, 180; entertainments, 23, 180; experiments with couplers, 150; height of draw-bars, 30; ladders and handles, 26, 177; limit gauges for round iron, 19, 170; position of brake-shafts, 24, 174; posting the names of members delinquent for dues, 35; publication of list of members and amounts paid by them, 100; publication of results of letter ballots, 100; revision of standards, 14; running boards, 26, 176; screw-threads, 19, 169; standards and appliances for the safety of trainmen, 31, 174, 177; steps, 26, 176; storing of line cars, 27, 179; see motions.
Resolutions, report of committee on, 151.
Reversed conicity, 55, 63.
Reversible hook, 88.
Rhodes, Mr., remarks of, 118, 122.
Rigid and swinging bolsters, motion relating to, 112.
Rigid bolsters, 110.
Rigid centre truck, 113.
Road-masters, 69.
Roll-call, 3.
Roofs for freight cars, committee on, 204; report on, 126.
Rote brake, 123.
Round iron, limit guages for, 19, 179.
Rules governing the condition of, and repairs to, freight cars for the interchange of traffic, 181-190.
Rule, standard two feet, 19.
Running boards, standard, 26, 176.

S

Sandberg's rail section, 65, 66.
Saratoga & Mt. McGregor Railroad, 28.
Saws and axes in cars, 33.
Sayre, Robert, 80.
Scranton Steel Company, rail rolled by, 48.
Screw-thread, 17; gauges, 19; standard, 68.
Second day's proceedings, 33.
Secretary, account of, 9; appointment of, 165; remarks of, 4, 13, 14, 28, 29, 31, 32, 34, 35, 38, 74, 94, 100, 113, 115, 116, 118, 124, 130; report of, 8; See Forney, Mr.
Sellers' system of screw-threads, 17, 168; William, 17.
Sharp flanges, cause of, 74; committee on, 85; report on, 86.
Side dumping and drop bottom coal cars, committee on, 204.
Slipping of wheels, 56, 58.
Smith, C. A., remarks of, 142.
Snow, Mr., remarks of, 80.
Solid brake-heads and shoes, 88.
Soule, Mr., remarks of, 97, 98, 130.
Springs, draw and buffer, capacity of, 173.
Standard, attachments for brake ratchet wheels, 175; attachments of draw-bars; axle, 17, 167, plate IX; letter ballot on, 156; brake-shoe, 88, 89, 108; brake-steps, 175; capacity of draw-springs, 171; diameter of chill molds, 166; dimensions, forms of construction, etc., adopted by the Master Car Builders' Association, 166-180; dimensions of dead-blocks; dimensions of draw-bars, 171: distance between backs of flanges of wheels, 16, 69, 166; draw-gear, 170; flange and tread, resolution relating to, 76; flange and tread proposed by Mr. Forney, 70, by Mr. Davenport, 77; for gauging rails, 51; for marking cars, 177, 178; form and proportion of treads and flanges, 39, 46, 51, 69, 70, 72, 83, 85; freight and passenger car trucks, 5, 35, 36, 110, 113; gauge for distance over guard and wing rails, 73; height of draw-bars, 14, 20, 170; house car, report of committee on, 101; journal bearing, journal-box and pedestal, 168, plates X, XI, XII; ladders and handles, 177; limit gauges for round iron, 170; position of brake-shafts, 174; rail sections, 41, 46, 51, 73; running boards, 176; screw-threads, 168; steps, 168; system of lettering and numbering fast freight line cars, 178; truck, 108, discussion of, 109, of 40,000 lbs. capacity, 116, report of committee on, 86, wheel-base of, 113; two foot rule, 19, 38; wheel and axle gauges, 14, 167, plate VIII.; width of wheel tread, 15, 166.
Standards adopted by the Master Car Builders' Association, 166-180, plates VIII., IX., X., XI., XII.; adoption of, 31, 34; advantage from the adoption of, 5; importance of, 109; codifier

tion of, 15; recommendation of, 31; report of Executive Committee on, 14-28, 163; resolution relating to errors, etc., of, 4.
State Commissioners, 114.
Steps, standard, for, 26, 176.
Storing of line cars, 27; resolution relating to, 179.
Subjects, committee on, 153, 204; list of, 202; report of, 116.
Swing bolsters, 108, 110; motion relating to, 112; vote on, 113.
Switch rails, 41.
Switches, gauge of, 41.
System of lettering and numbering line cars, letter ballot on, 156; standard, 178.

T

Tallman brake, 122, 123.
Terry, J. C., not eligible for membership, 163.
Third day's proceedings, 100.
Theory of chilling, 47.
Throat of flange, 49, 52, 83; chill of, 53; radius of, 74, 76, 85.
Townsend, Mr, remarks of, 118, 131, 149.
Trainmen, protection of from accidents, 23, 174; committee on, 203.
Tracks, gauge of, 40; plate IV, V, circular relating to, 39.
Transportation officers, 114.
Trap-doors in roofs of passenger cars 32; committee on, 204; report of committee on, 115.
Townsend, Mr., remarks of, 107.
Treads and flanges of wheels, committee on, 202; form of, 34, 39; of German State Railroads, 43; proposed standard form of, 72.
Treads, cylindrical, 54.
Treads of coned wheels, 64.
Treads of wheels, standard width of, 166.
Treasurer's report, 13.
Trial of automatic couplers, 113, 114.
Trucks, committee on, 202; motion to continue committee on, 116; plan of plates I, II, III, standard, 5, 108, 113; of 40,000 lbs. capacity, 116; report on, 35, 36, 86; wheel-base of, 113.
Truss, diagonal, 106.
Trussing cars, 107.
Truss-cars for brake bar, 87.
Trust companies, 98.
Turn-outs, 41.

U

United States coupler, 150.
United States Rolling Stock Co., 98.

V

Verbrych, Mr., remarks of, 30, 34, 93, 116, 146.
Vote of thanks to Secretary, 152.
Vertical plane, 137, 138, 141, 144. 145, 147, .

W

Wall, Mr., remark of, 28, 29, 84, 85, 86, 89, 1 107, 112, 113, 115, 116, 117, 118, 121, 124, . 138, 140, 143, 144, 145, 147, 149, 153.
Washington, 130.
Watkin's Glen, 129.
Wear of throat of flange, 52.
Weigh-master, 98.
Weight of car, 97.
Westinghouse automatic brake, 122, 165; motio relation to, 124.
Wheel and axle gauges, 16, 167, plate VIII.
Wheel-base of standard truck, 113.
Wheel-gauge, standard, 14, 166; plate VIII.
Wheel-sections, motion relating to, 86.
Wheel-tread, standard width of, 15, 166; and flang committee on, 83, 84, 85.
Wheels and axles, 15; plate VIII and *rails*, in rela tion to each other, paper on, 39; boring of, 17, 167; coned, 54; end play of, 49; gauge of, 49, 166; form of treads and flanges of, 39; plate VII, committee on, 202; worn, 63, 64; 42-inch, 117.
Whitney, Mr., 84.
Widening of gauge, 41.
Width of wheel-tread, 14, 15, 166.
Wilder, F. M., remarks of, 84, 85, 89, 105, 106, 107, 109, 110, 112, 113, 114, 129, 130, 136, 138, 139, 141, 143, 146, 147, 148, 149, 150.
Wilson & Walker coupler, 140, 142, 146, 147, 150.
Wing-rails, 41, 71.
Wing and guard rails, standard gauge for, 73.
Wood, Mr., remarks of, 119, 124, 126.
Wooden truck, 110.
Worn wheels, from New York Central Railroad, 63; templates of, 17.
Wrought-iron brake shoes, 87.